

1/ 332

108-127USA000

JC828 U.S. PTO

10/067540

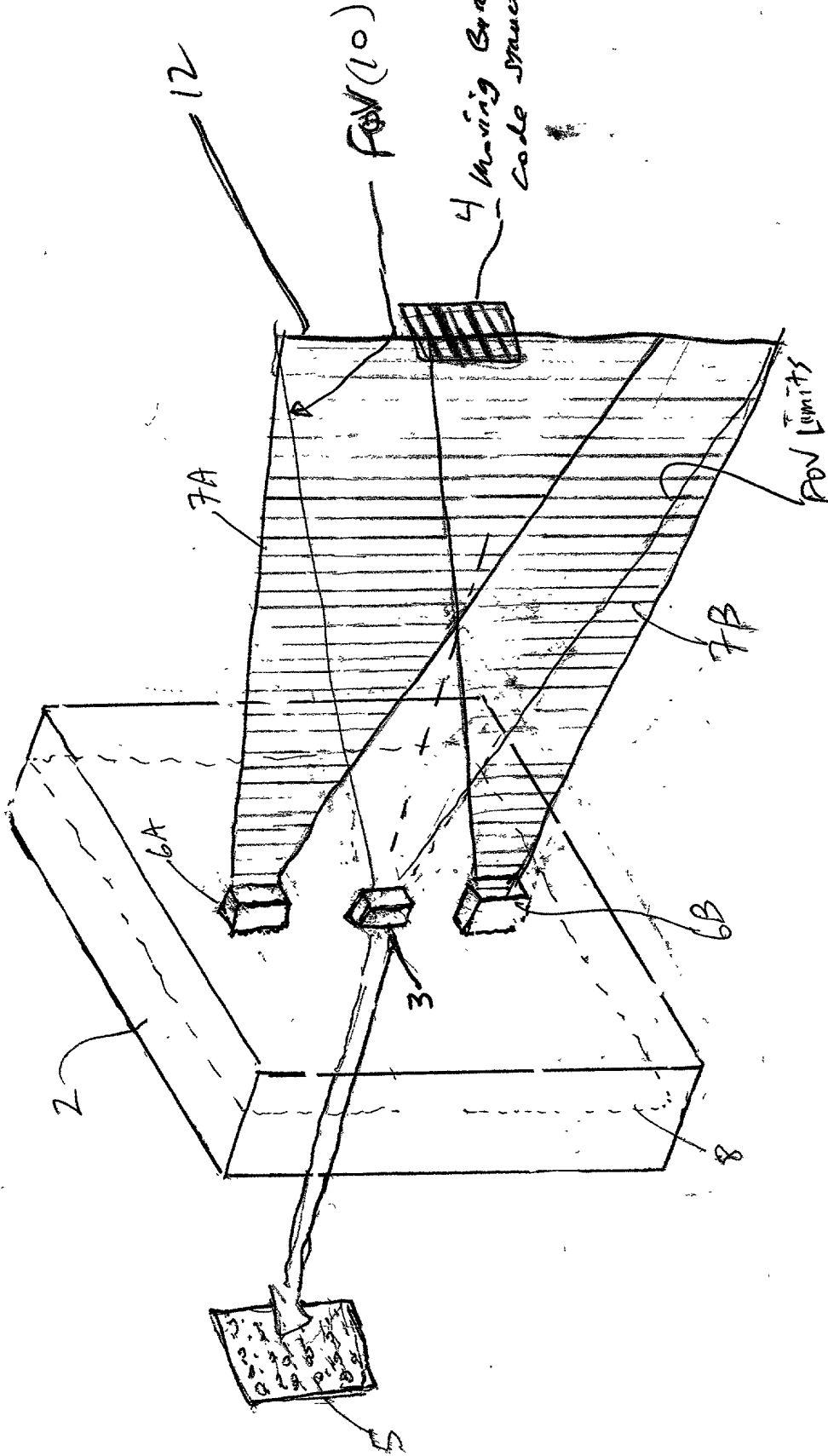
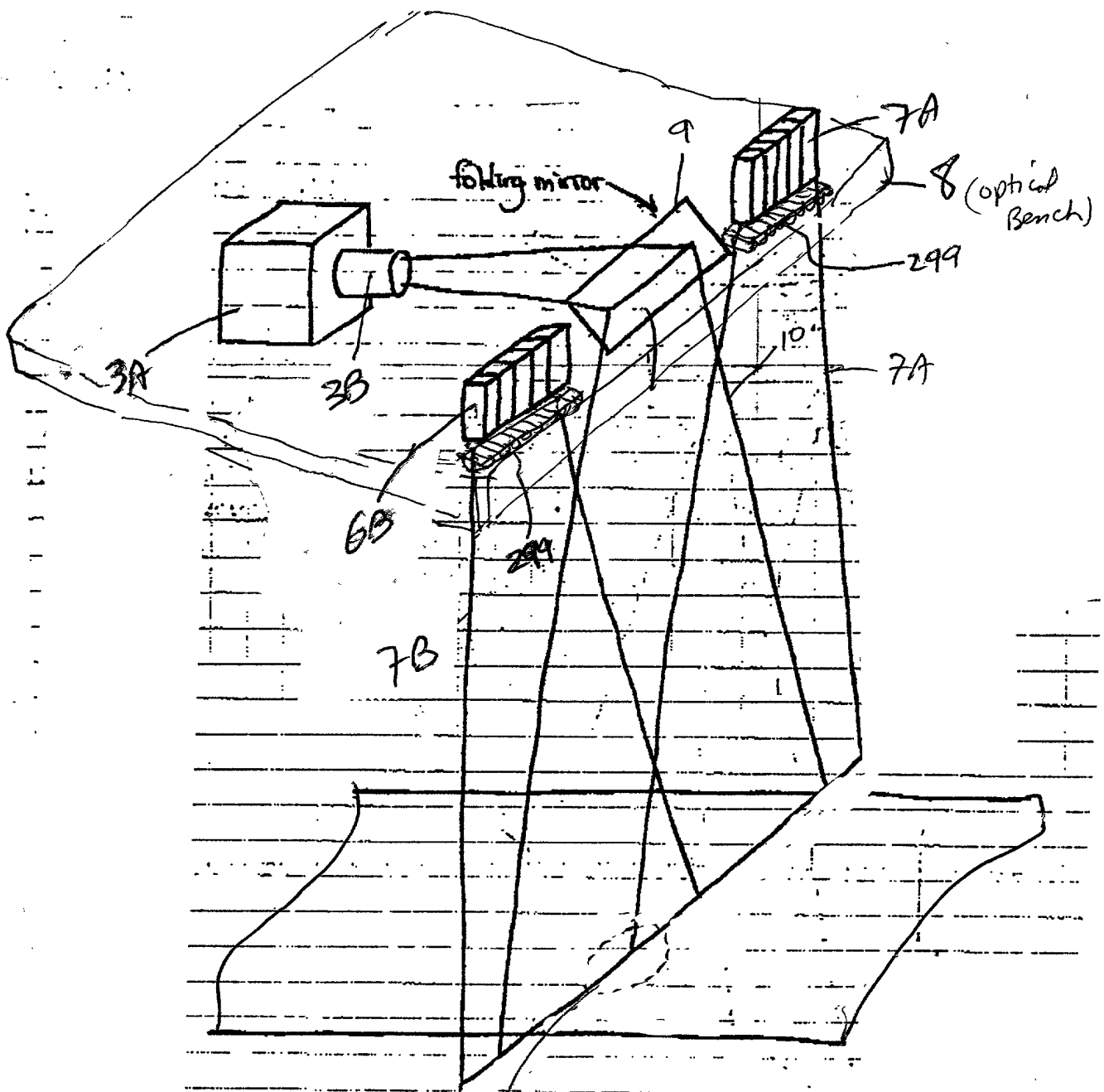


FIG 1A

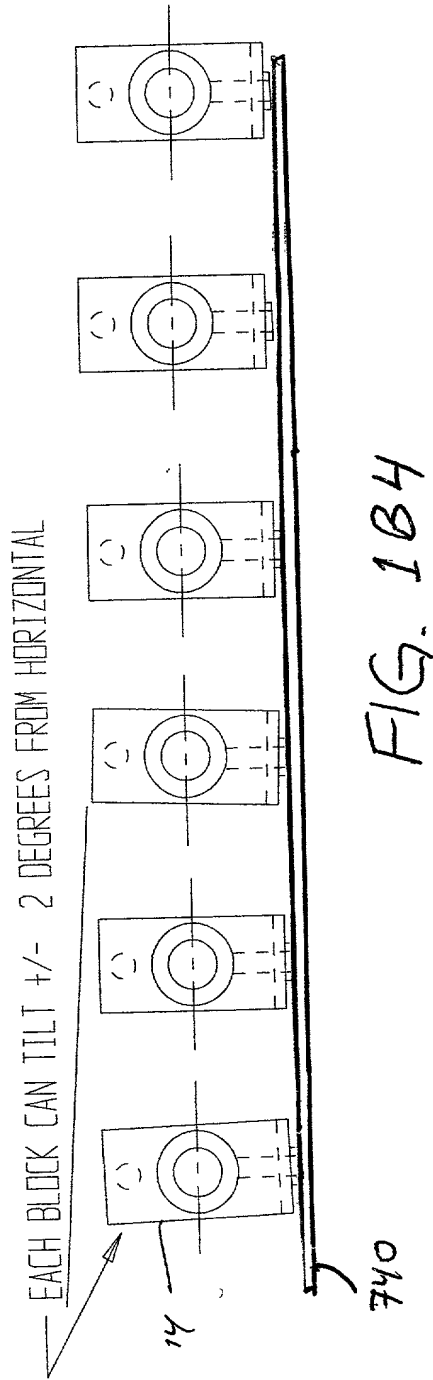
2/332



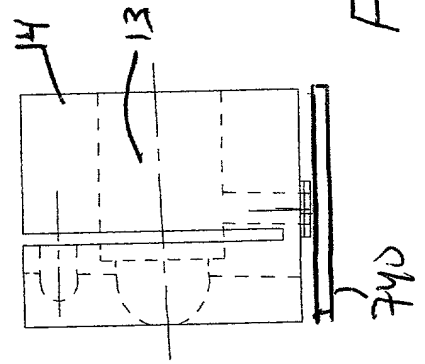
1A

Magnified Field of View of
CCD sensor element on
object
width of projected
Planar laser illumination
beam on
object

FIG 1B3



VLD BLOCK CAN PITCH FORWARD FOR ALIGNMENT WITH OTHER VLD BEAMS



$$I(y_c) = \text{gaussian}$$

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Maximum
object
range

FIG. 1C



FIG. 1E1

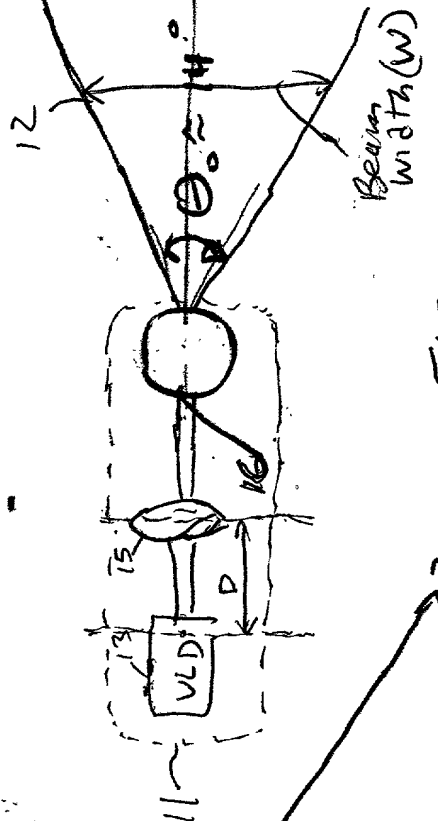


FIG. 1D

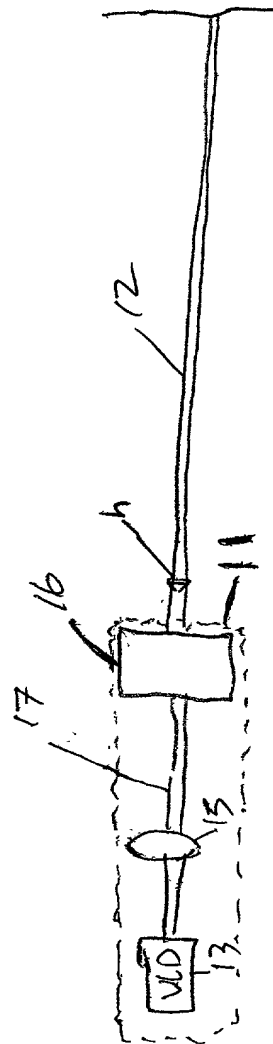
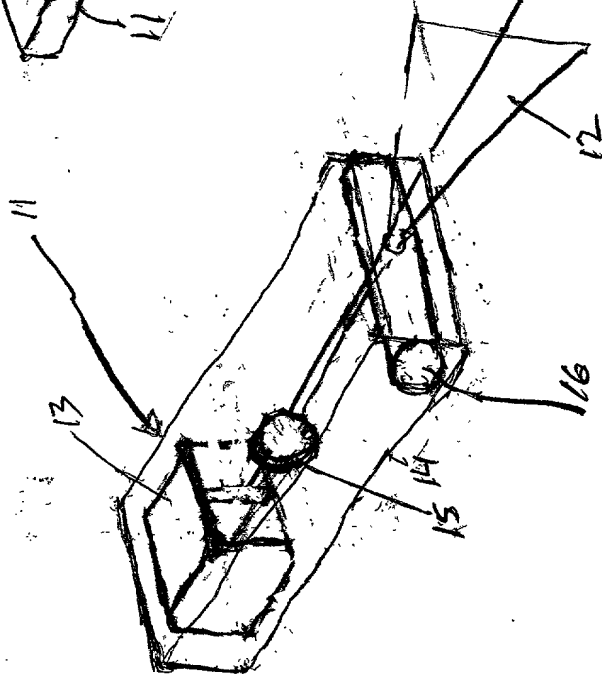


FIG. 1E2

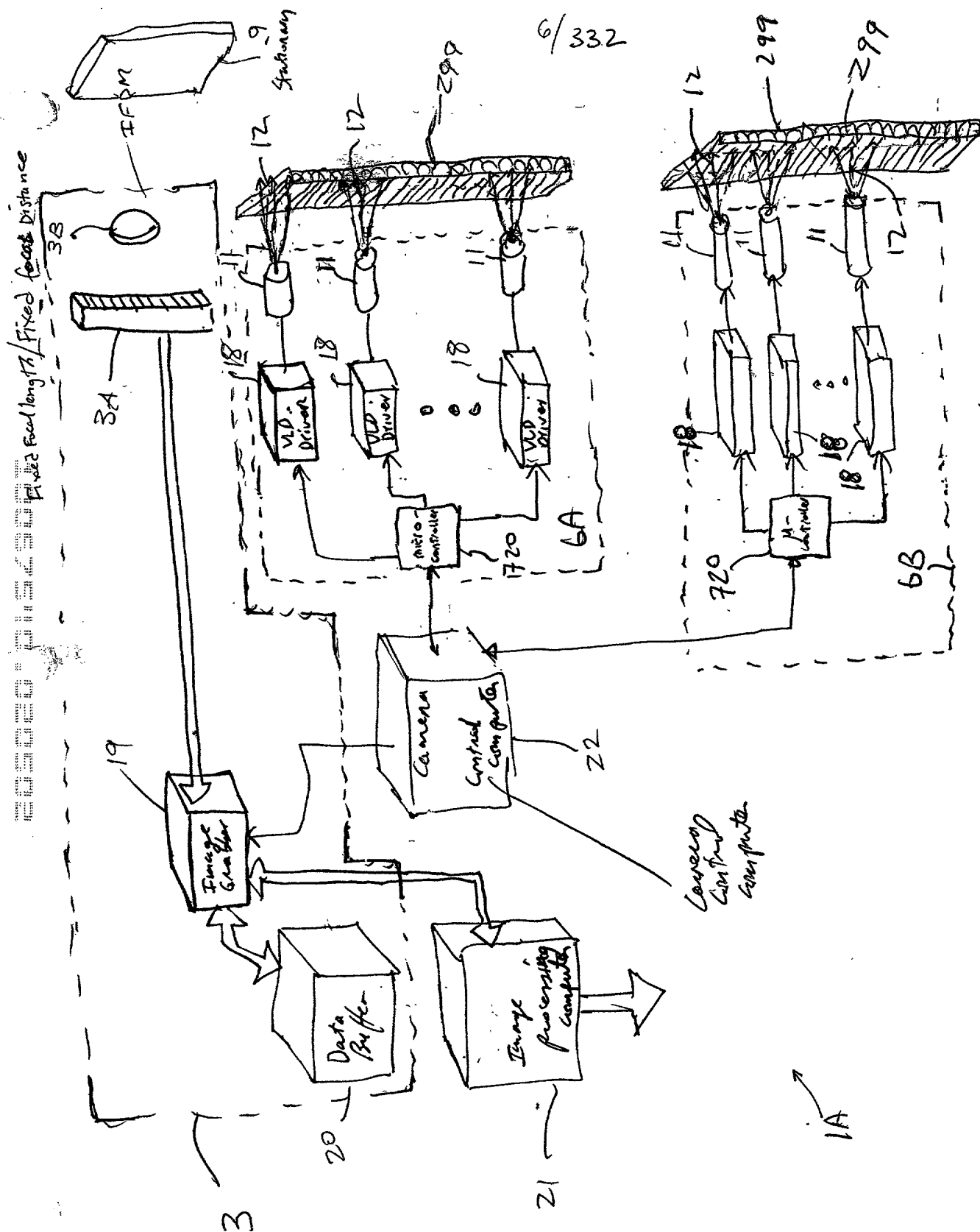
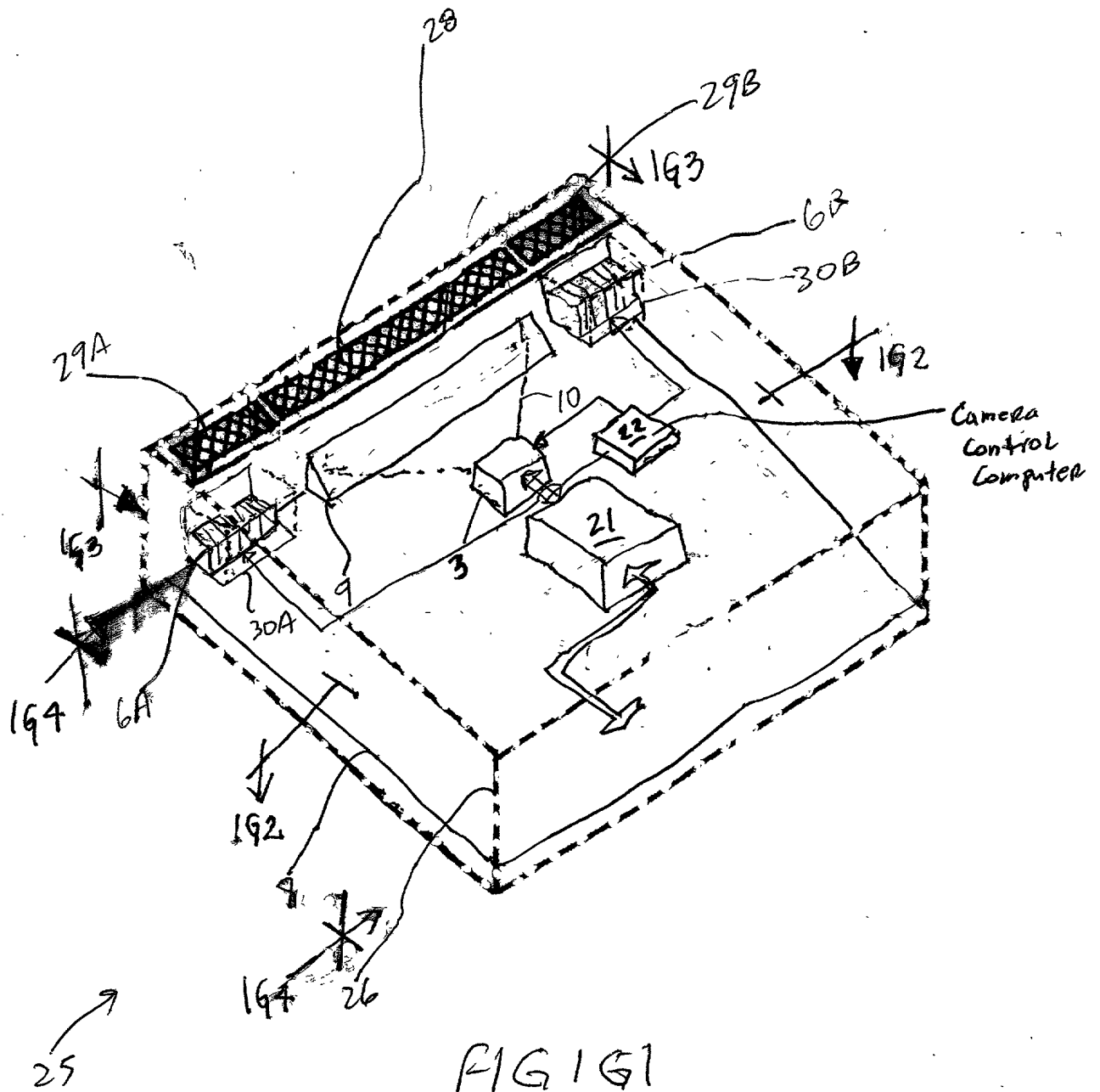


FIG. 1F



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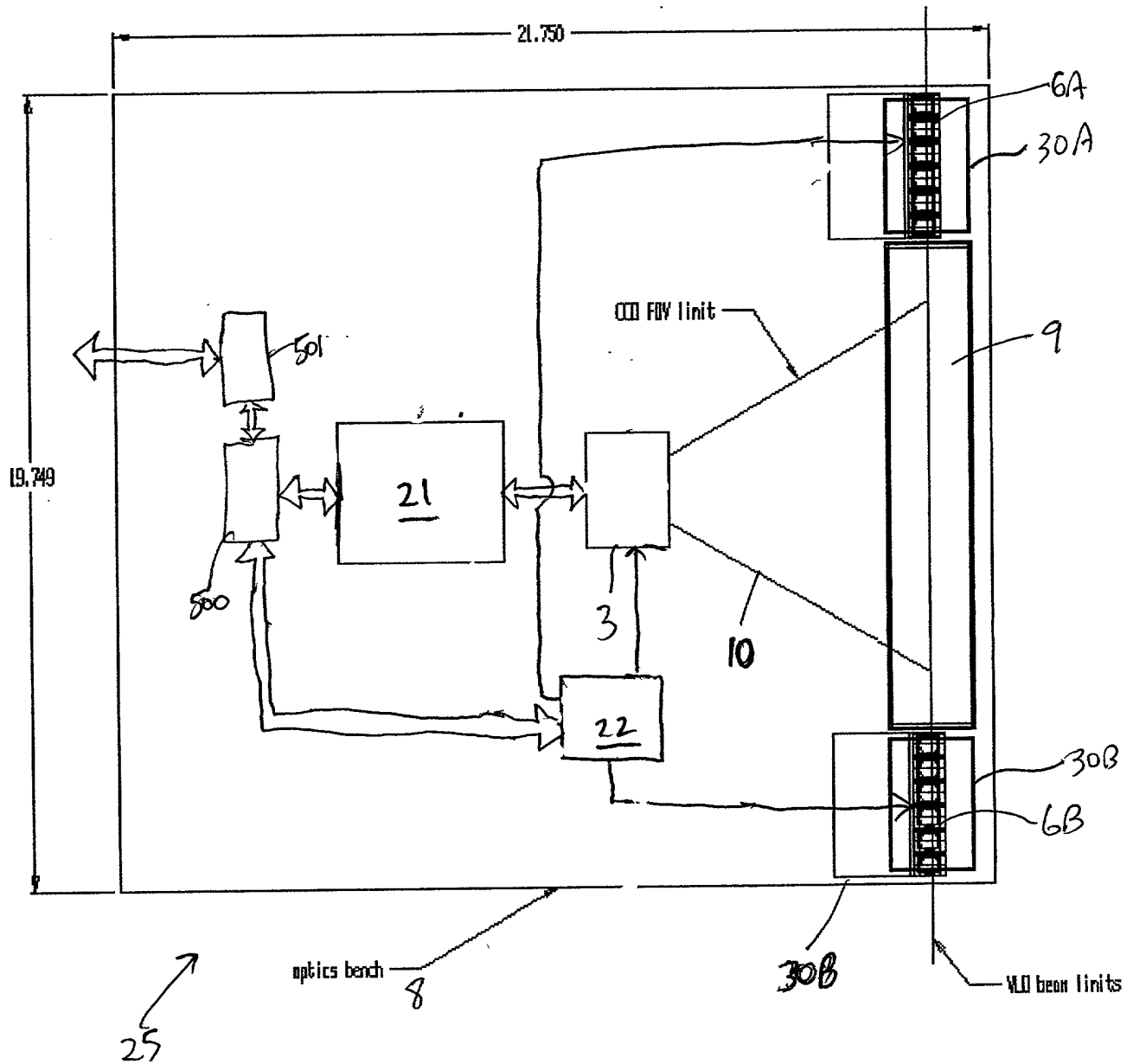
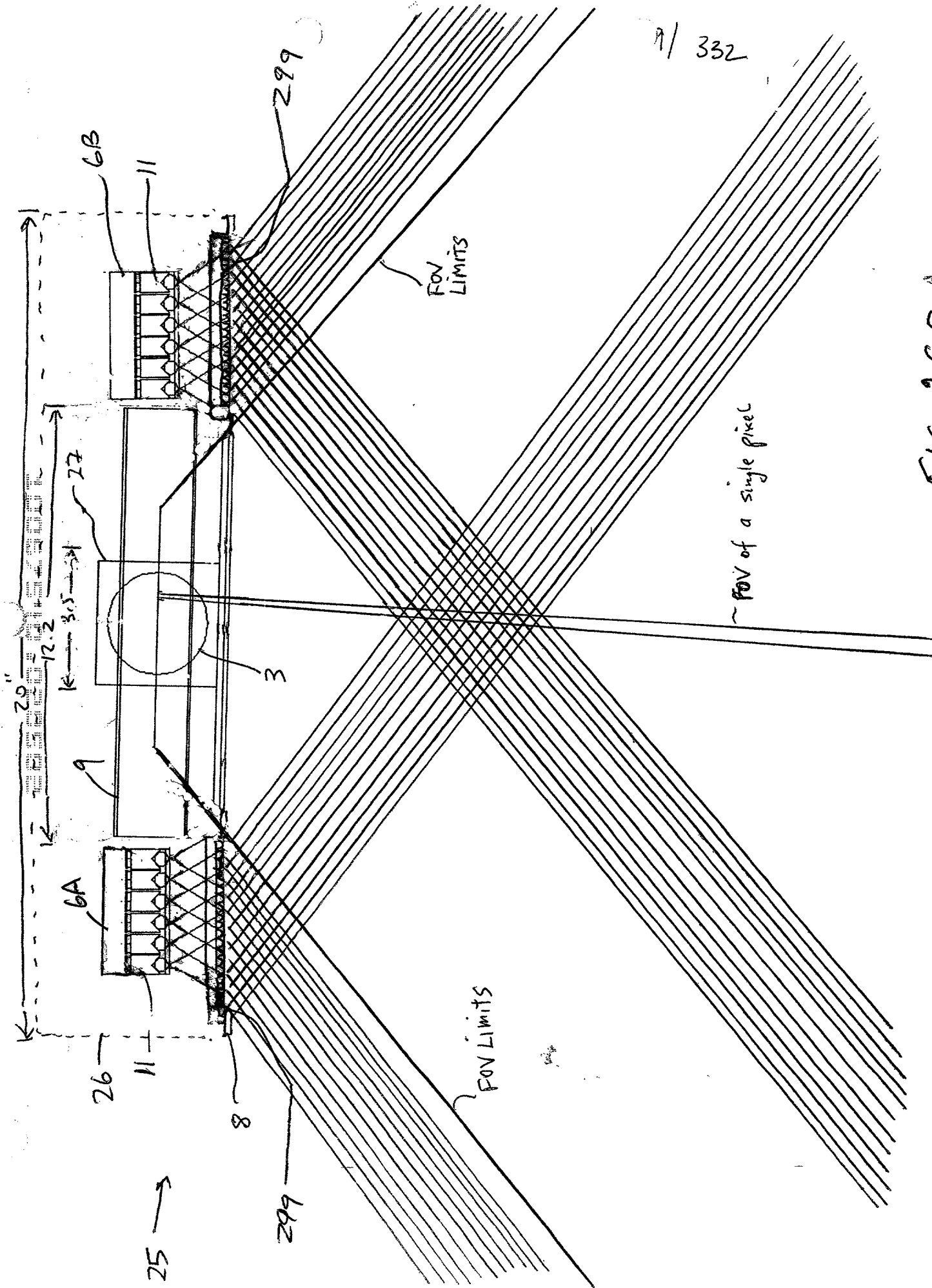


FIG. 1G2



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FIG. 1G3.

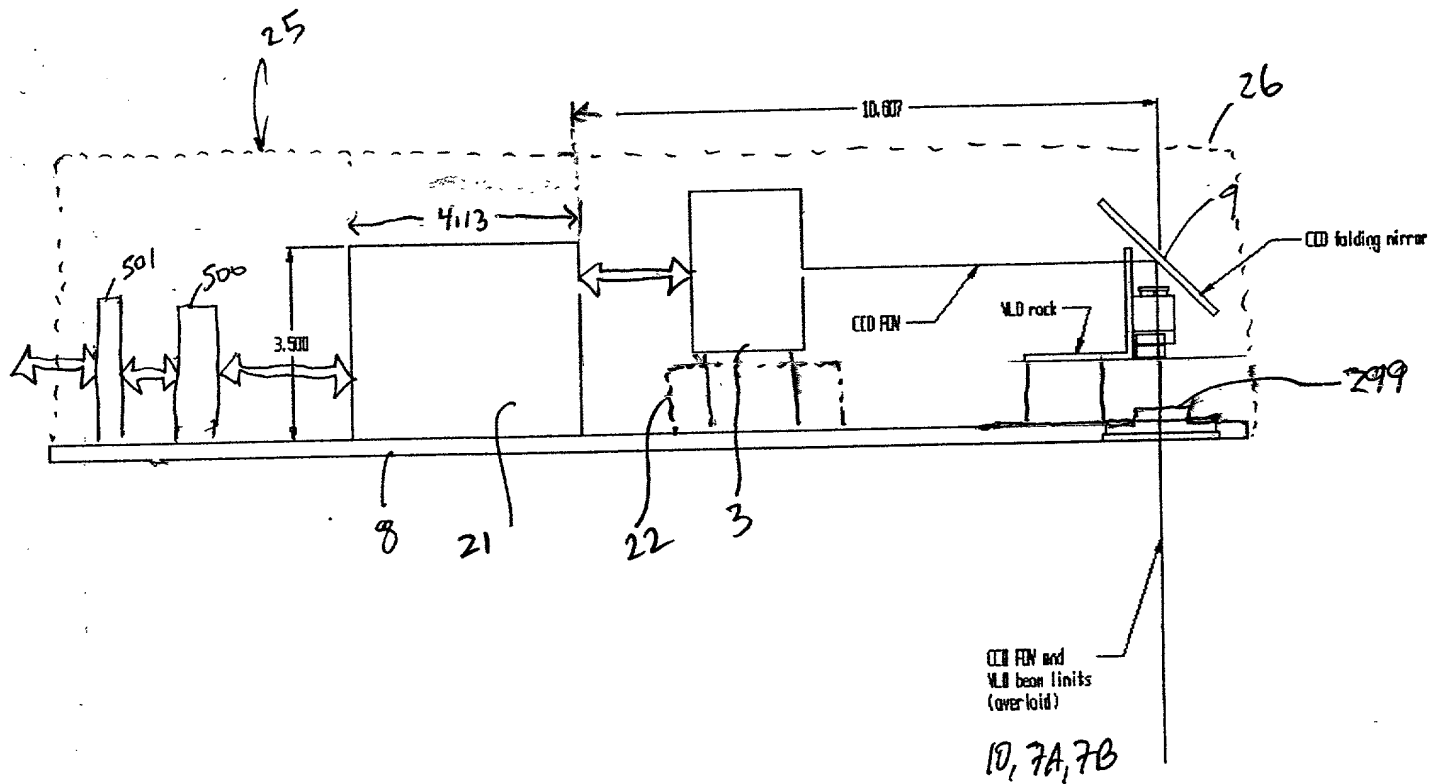
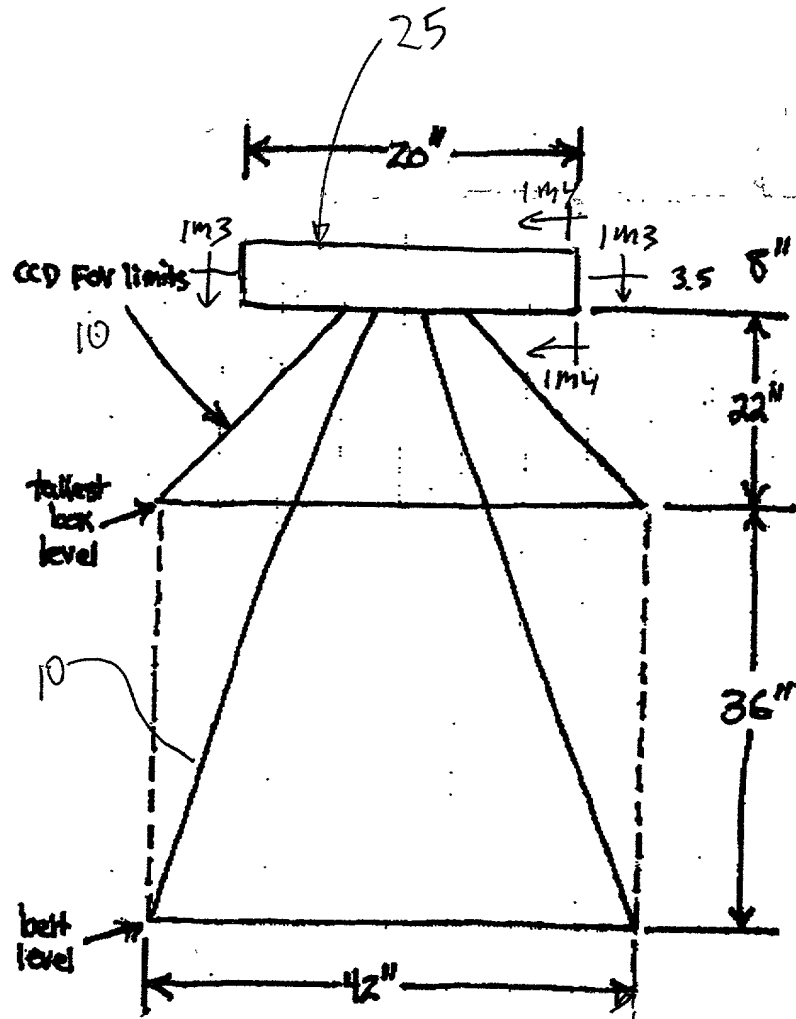


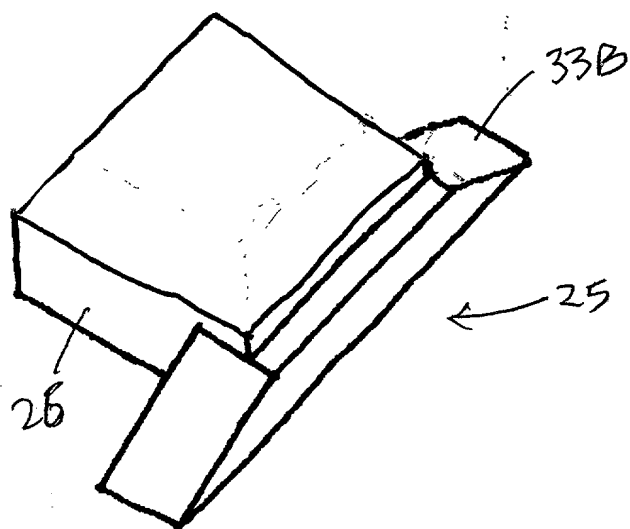
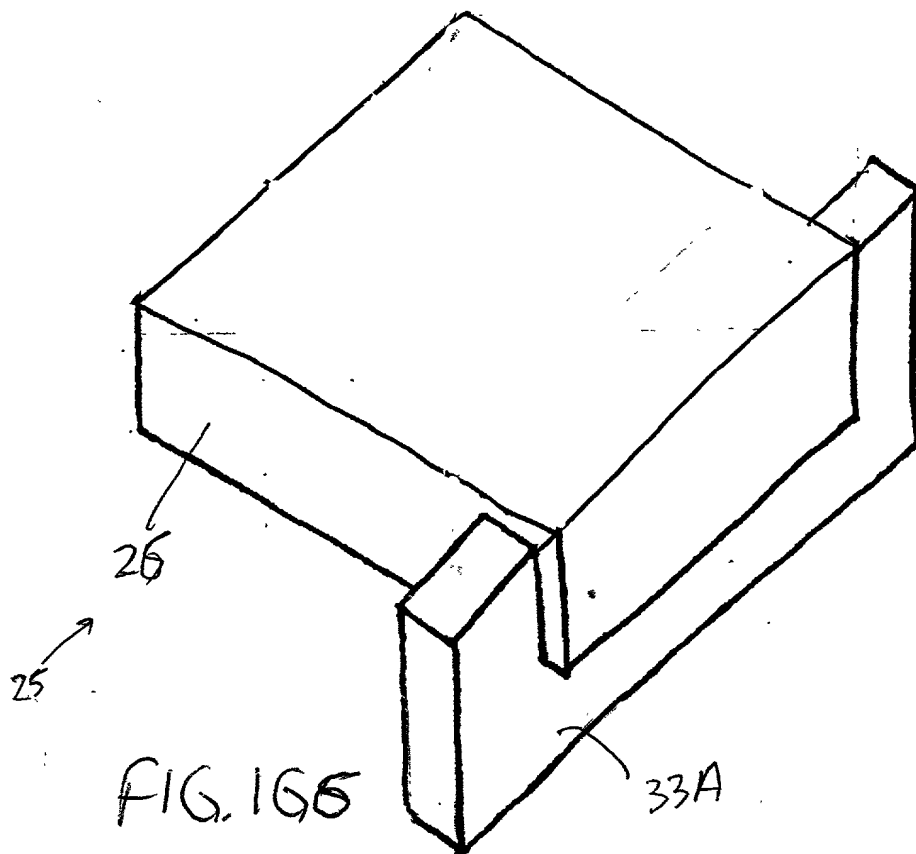
FIG. 164

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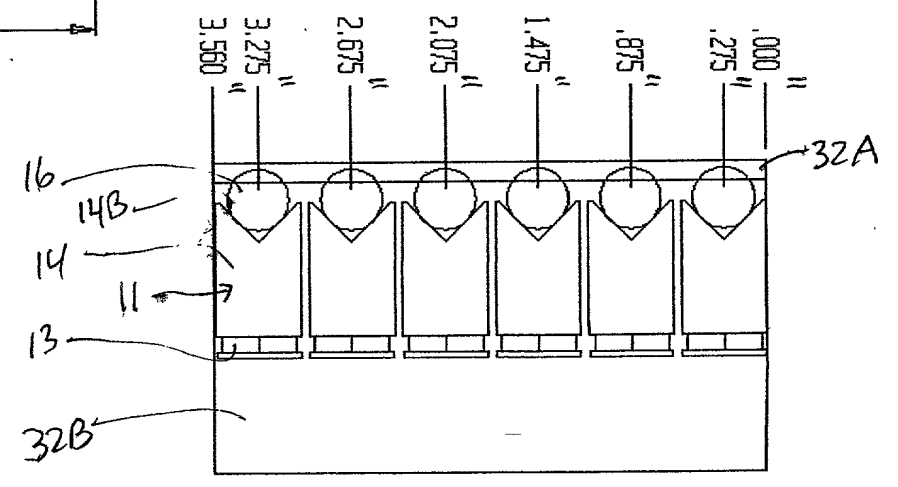
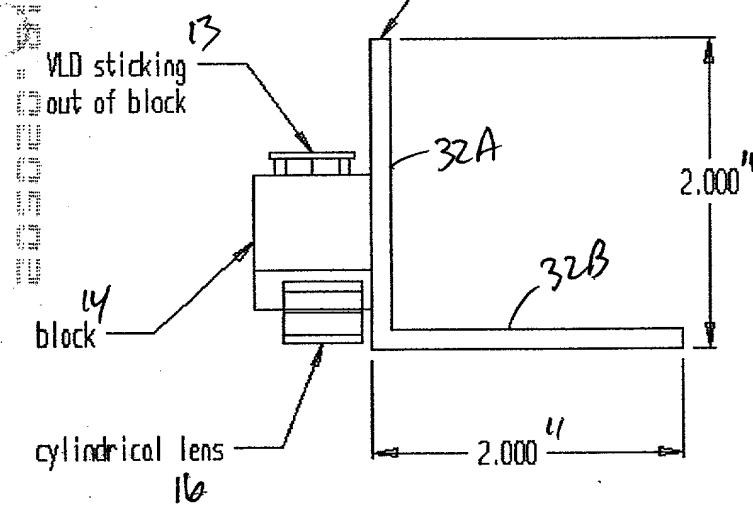
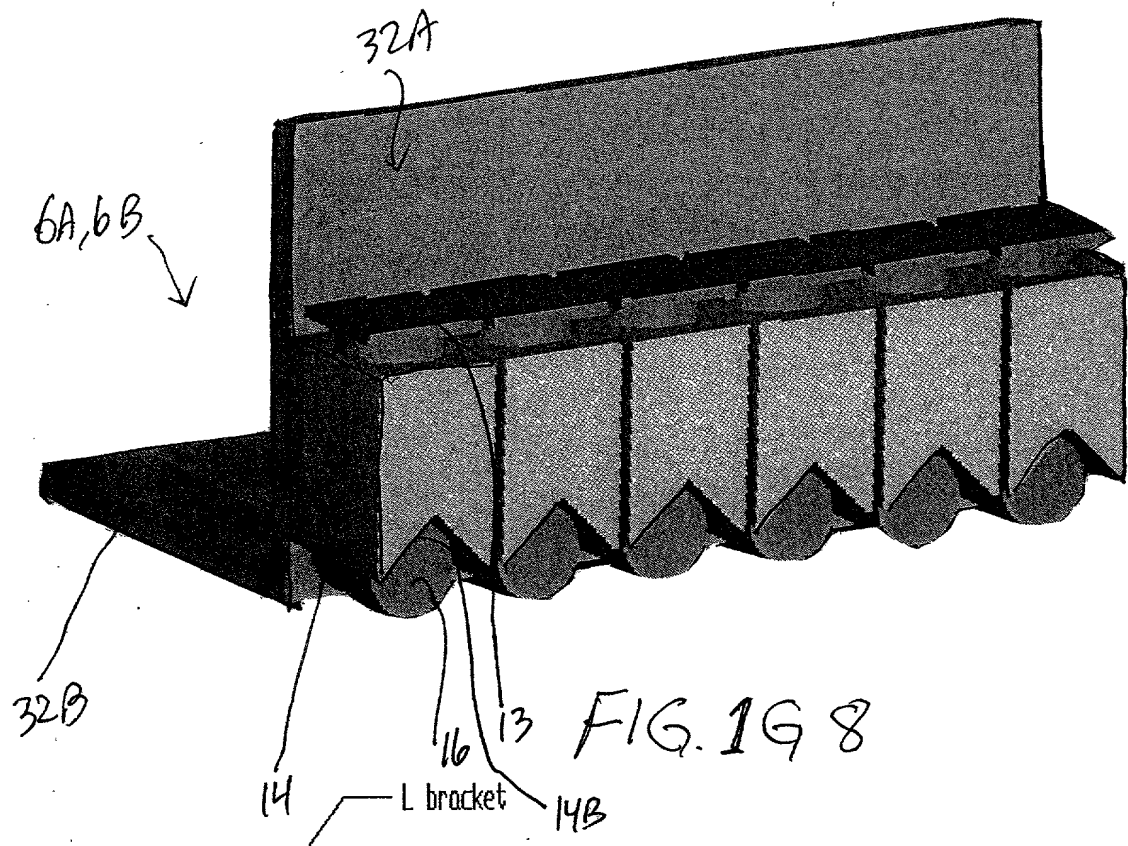


* Fixed Field of Field

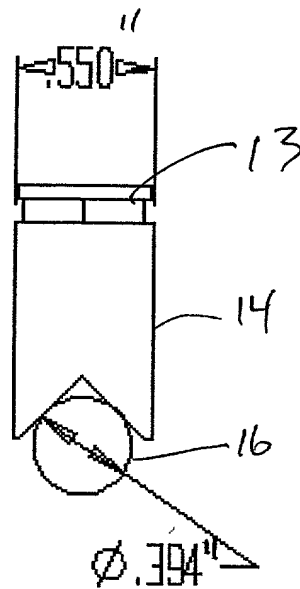
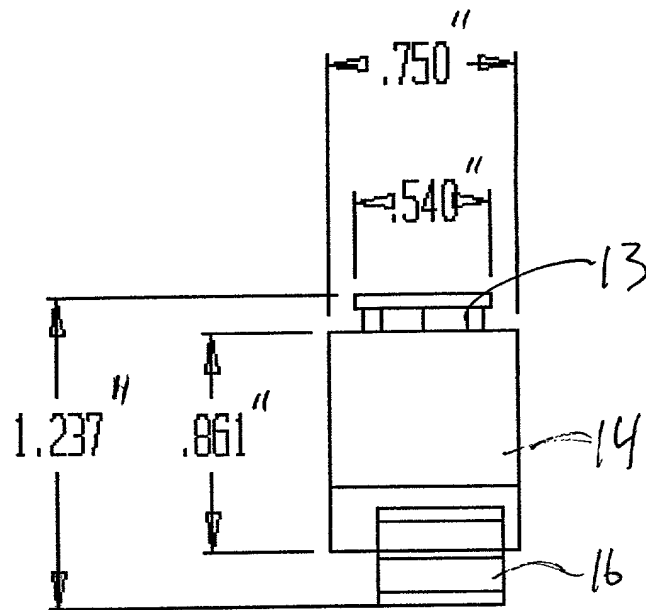
FIG. 145



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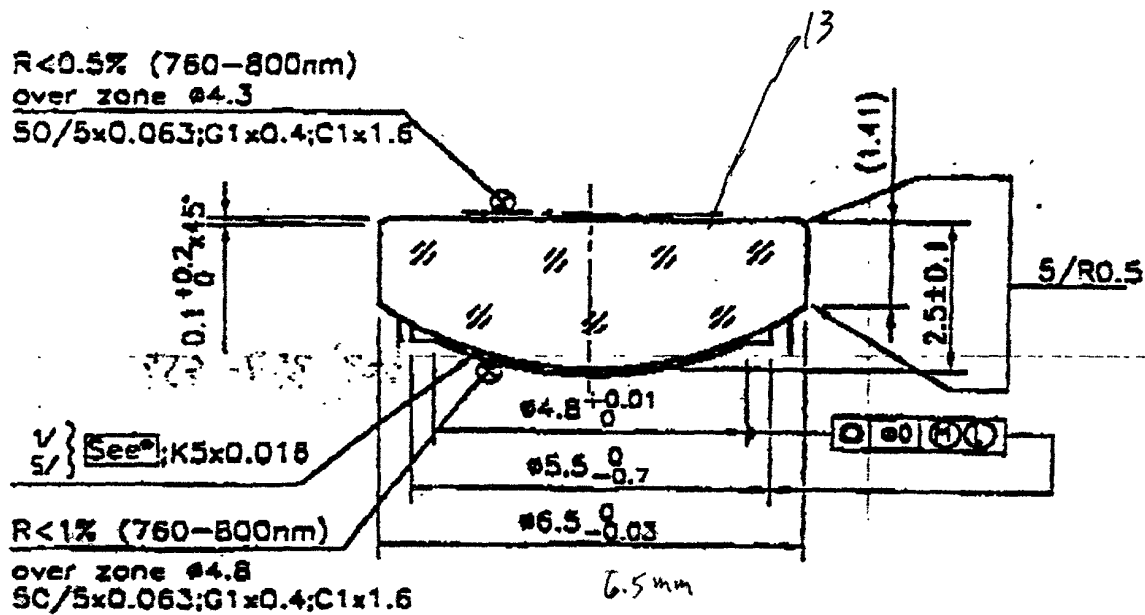


FIG. 1G13

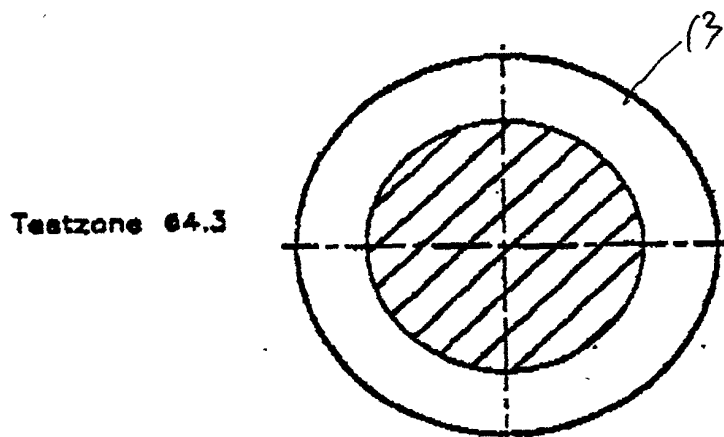


FIG. 1G14

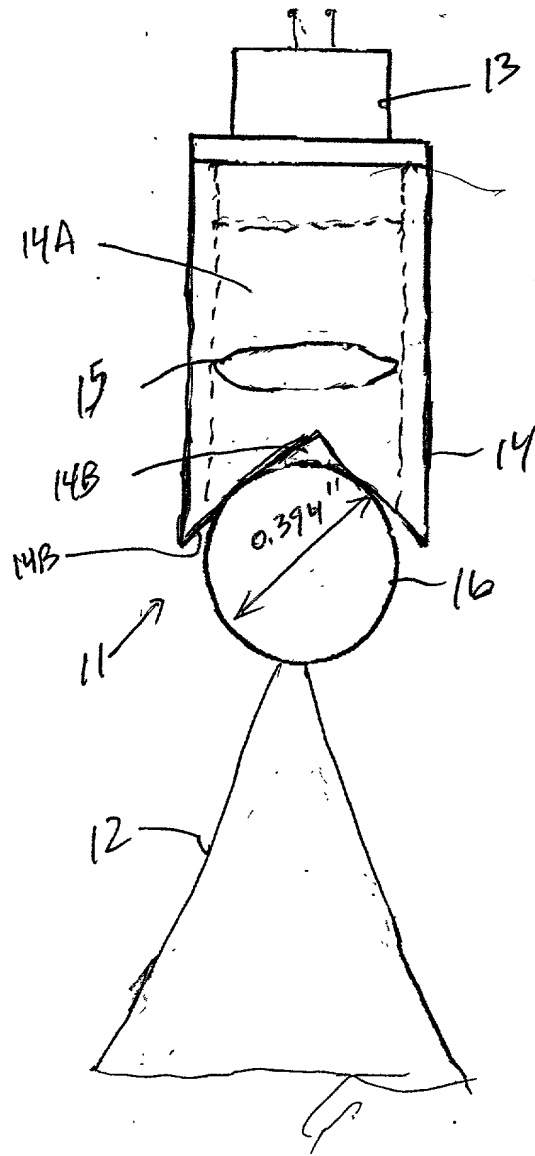


FIG. 1G15A

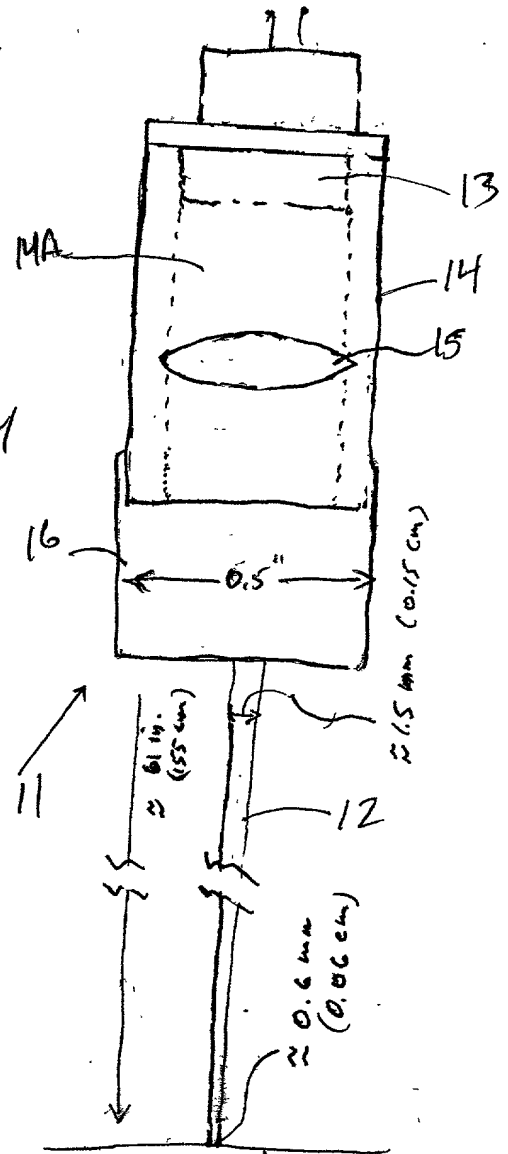


FIG. 1G15B

furthest
object/working
distance

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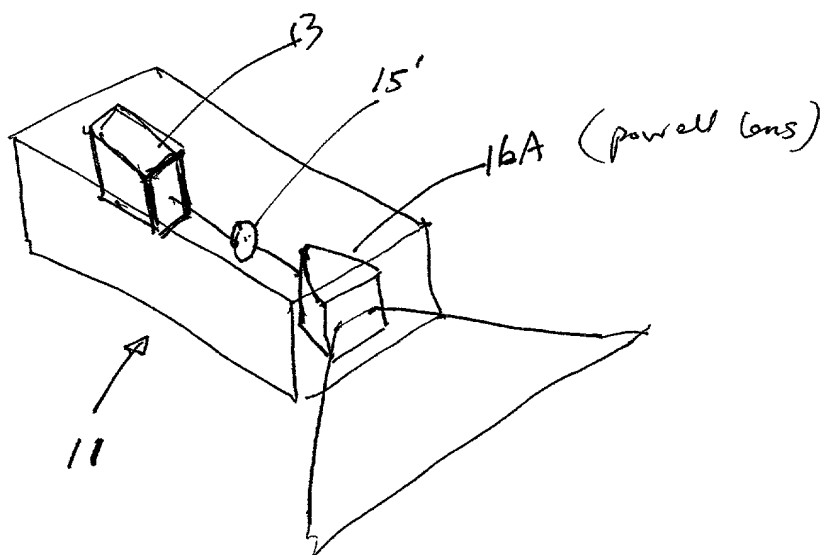


FIG. 1G.16A

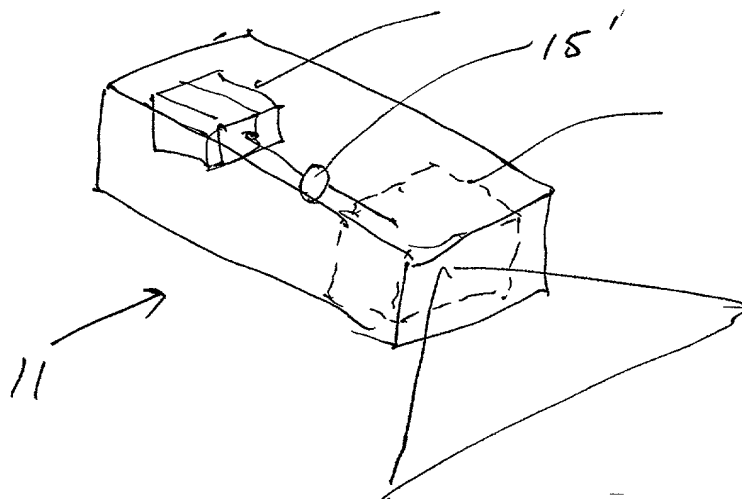


FIG. 1G.16B

PLIM w/
powell lens

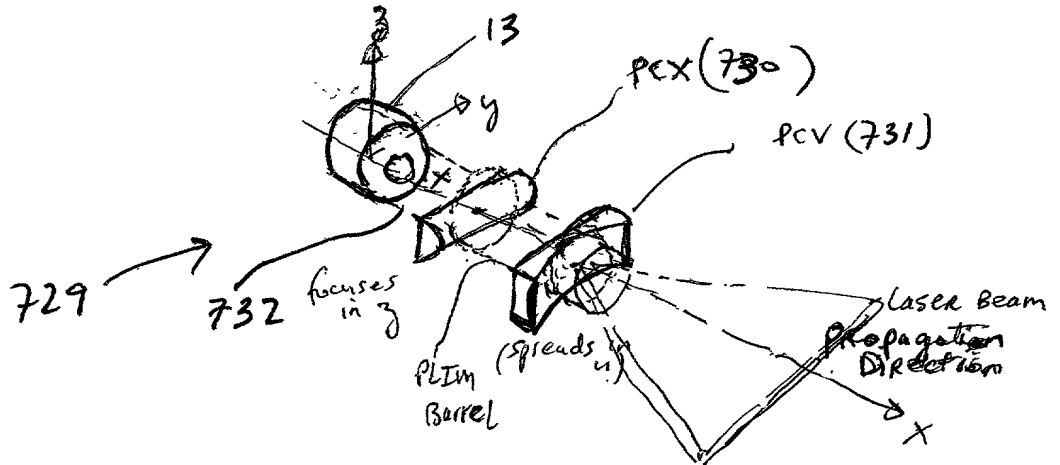


FIG. 16.17A

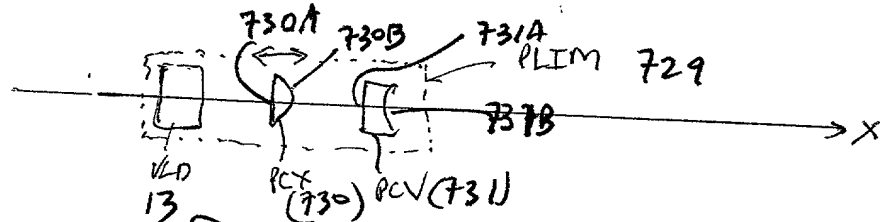


FIG. 16.17B

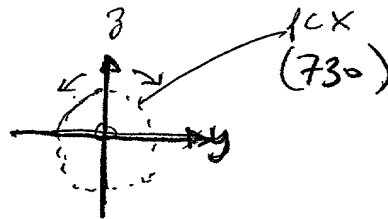


FIG. 16.17C

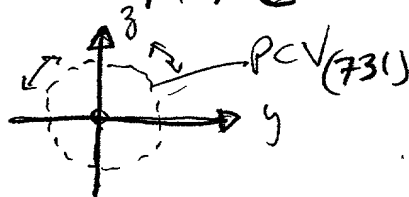


FIG. 16.17D

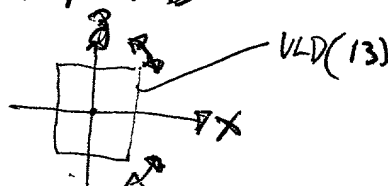


FIG. 16.17E

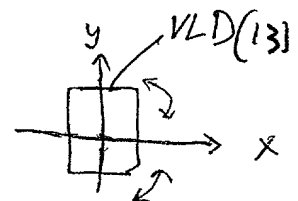
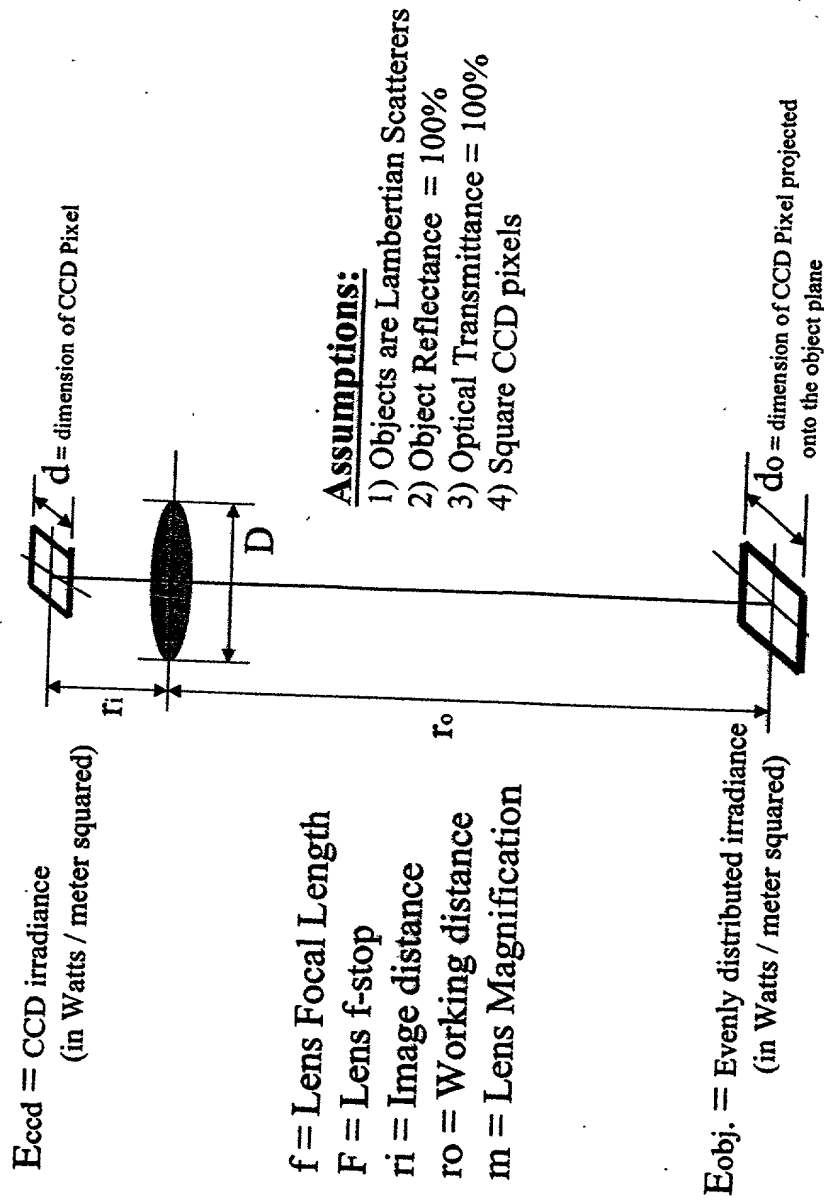


FIG. 16.17F

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CCD-Based Scanner

FIG. 1H6

FIRST GENERALIZED METHOD
of Reducing Speckle-Noise
PATTERNS AT IMAGE
DETECTION array OF THE
SPM subsystem (3)

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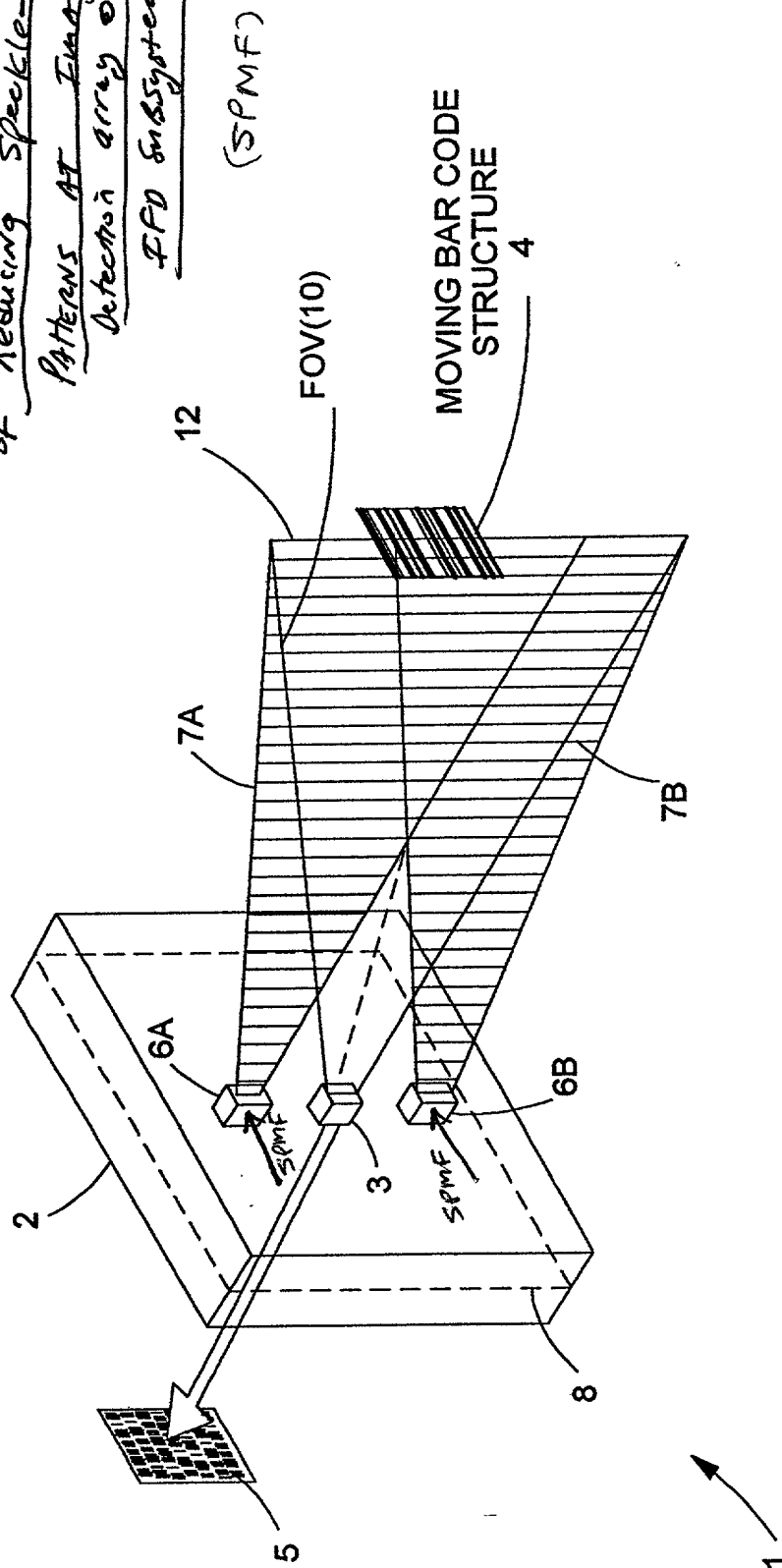


FIG. 1I1

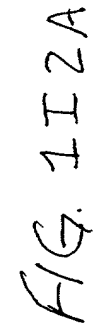


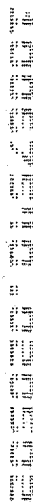
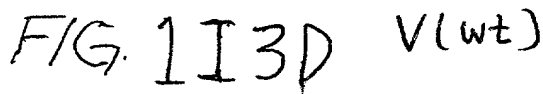
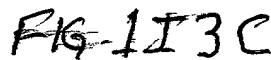
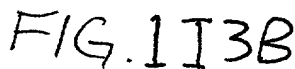
FIG. 1I2A

The First Generalized Speckle-Noise Pattern Reduction Method
Of The Present Invention

Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the spatial phase of the transmitted PLIB along the planar extent thereof according to a spatial phase modulation function (SPMF) so as to produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce the power of the speckle-noise pattern observed at the image detection array.

FIG. 1I2B


$$f_{osc.} \approx 20 \text{ KHz}$$


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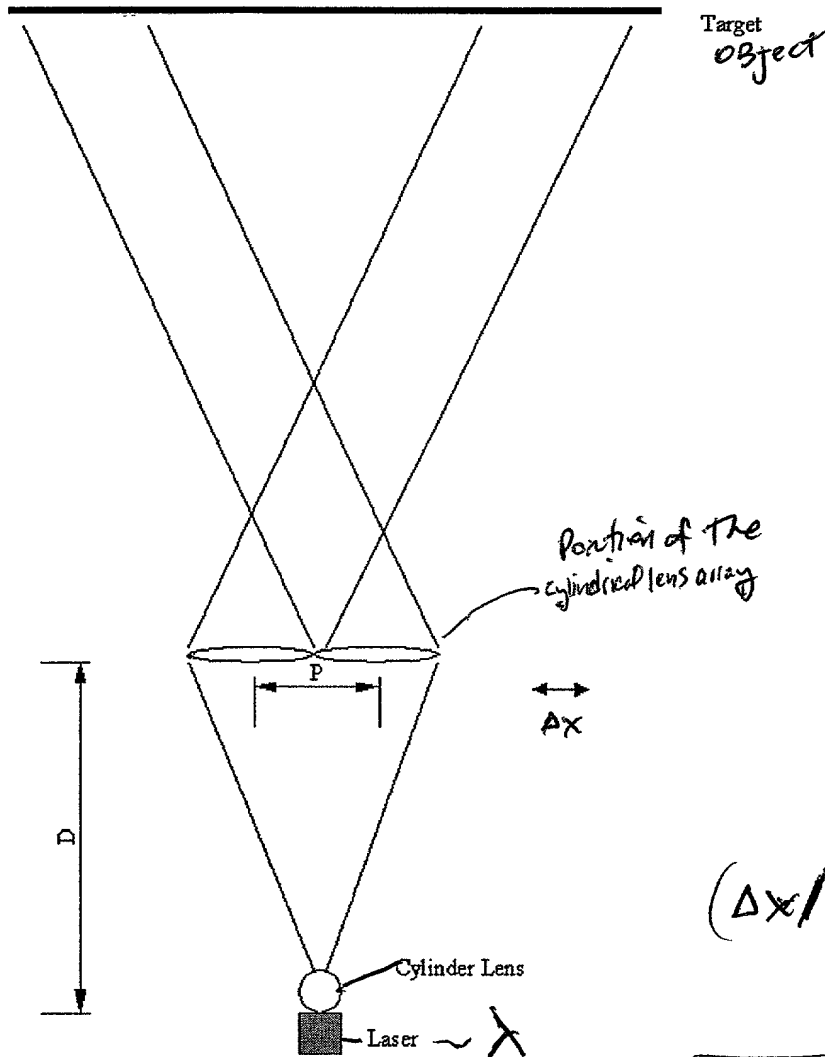


Figure 1

$$(\Delta x / D) P = \lambda$$

$$\Delta x \geq \frac{\lambda \cdot D}{P}$$

FIG. 1I3E

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FIG. 1I3F

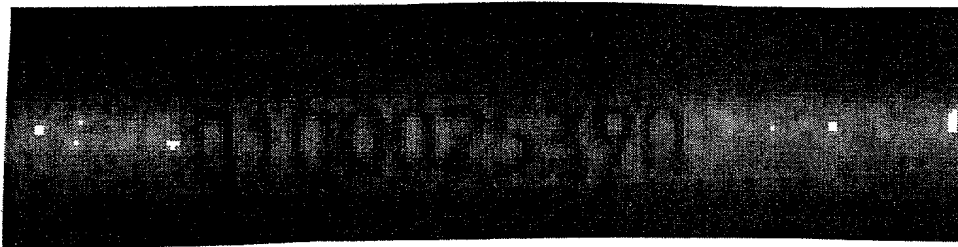


FIG 1I3G

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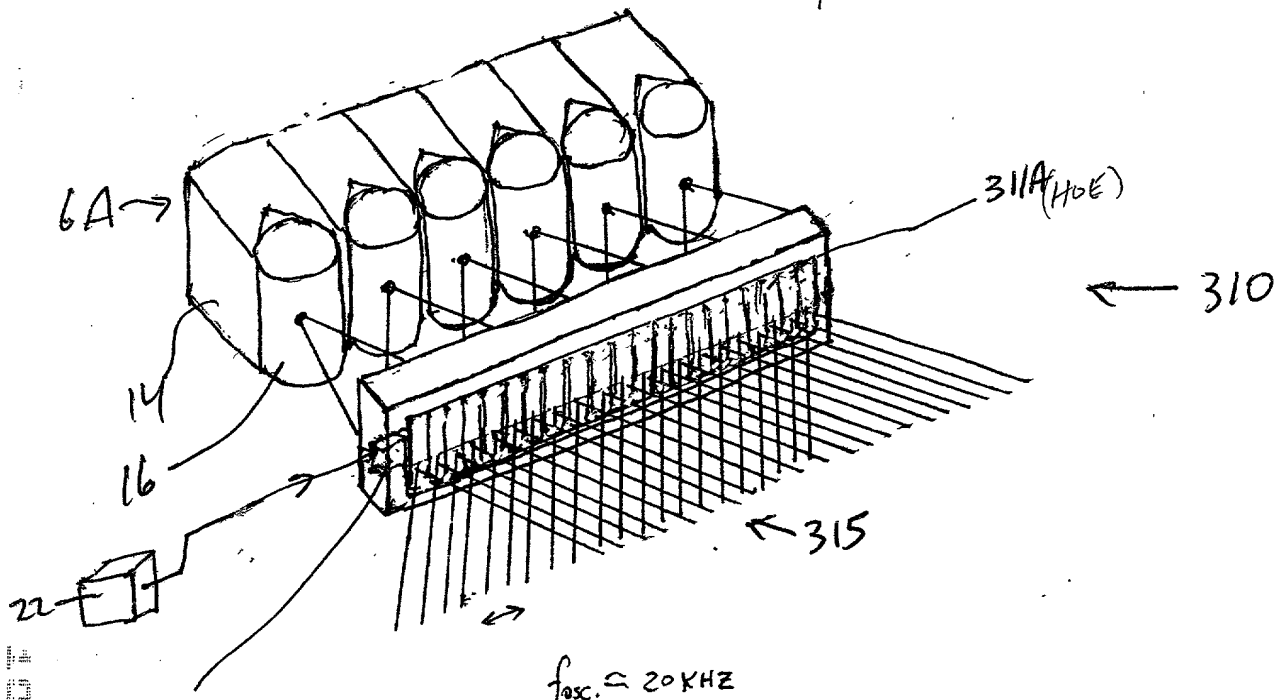


FIG. 1I4A

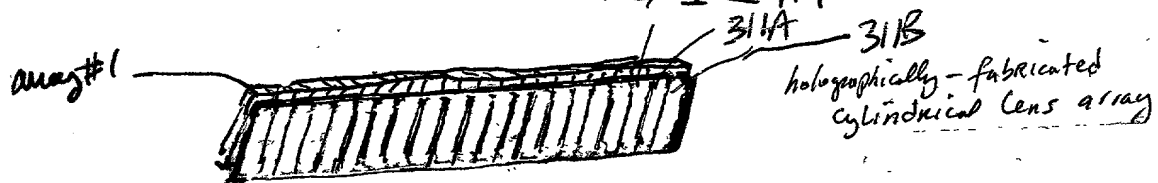


FIG. 1I4B

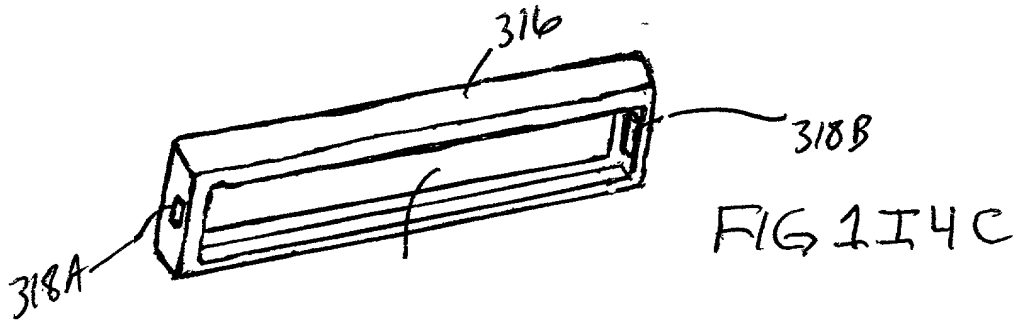


FIG. 1I4C

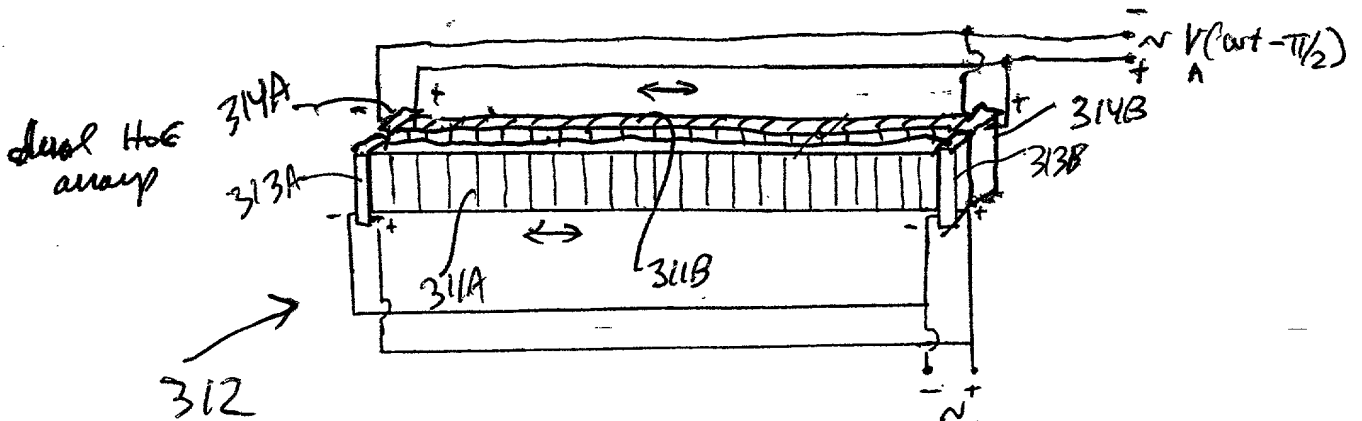
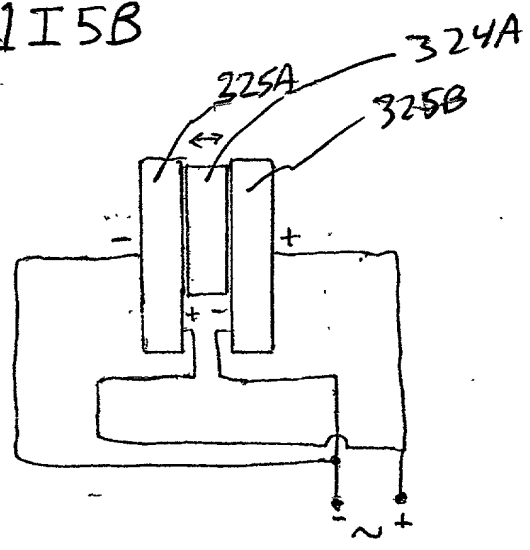
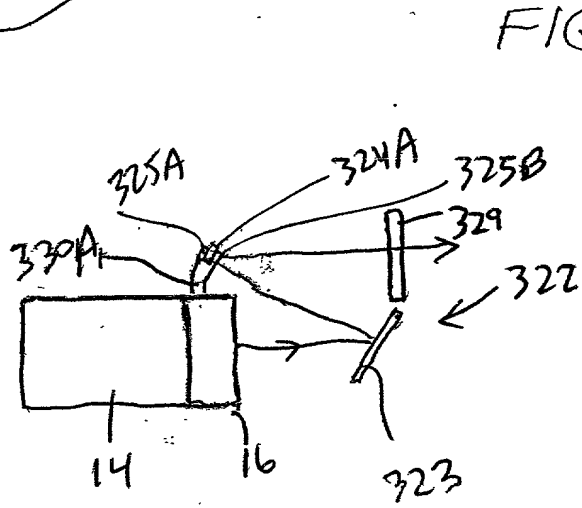
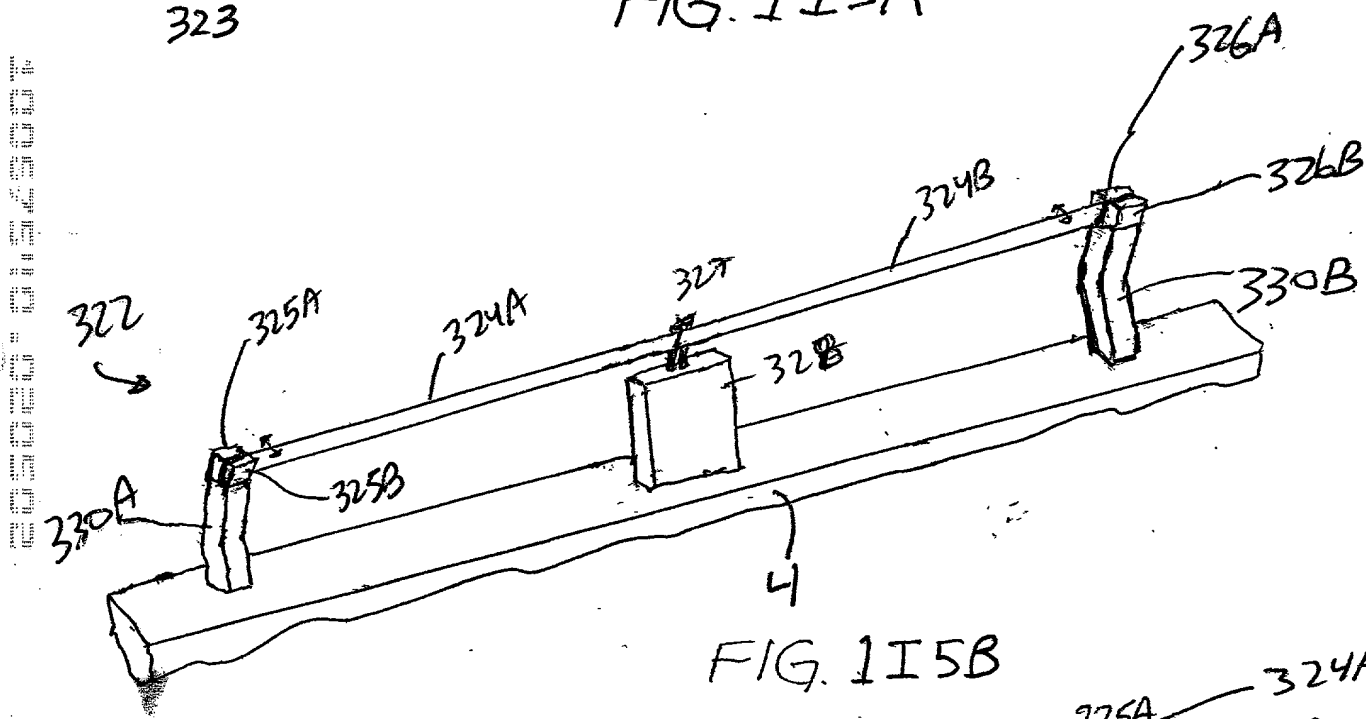
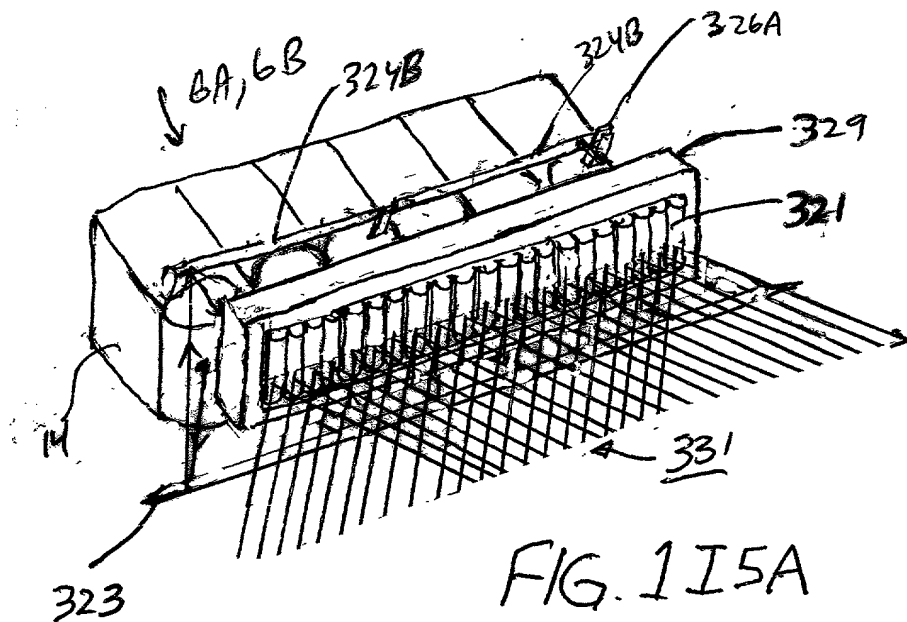
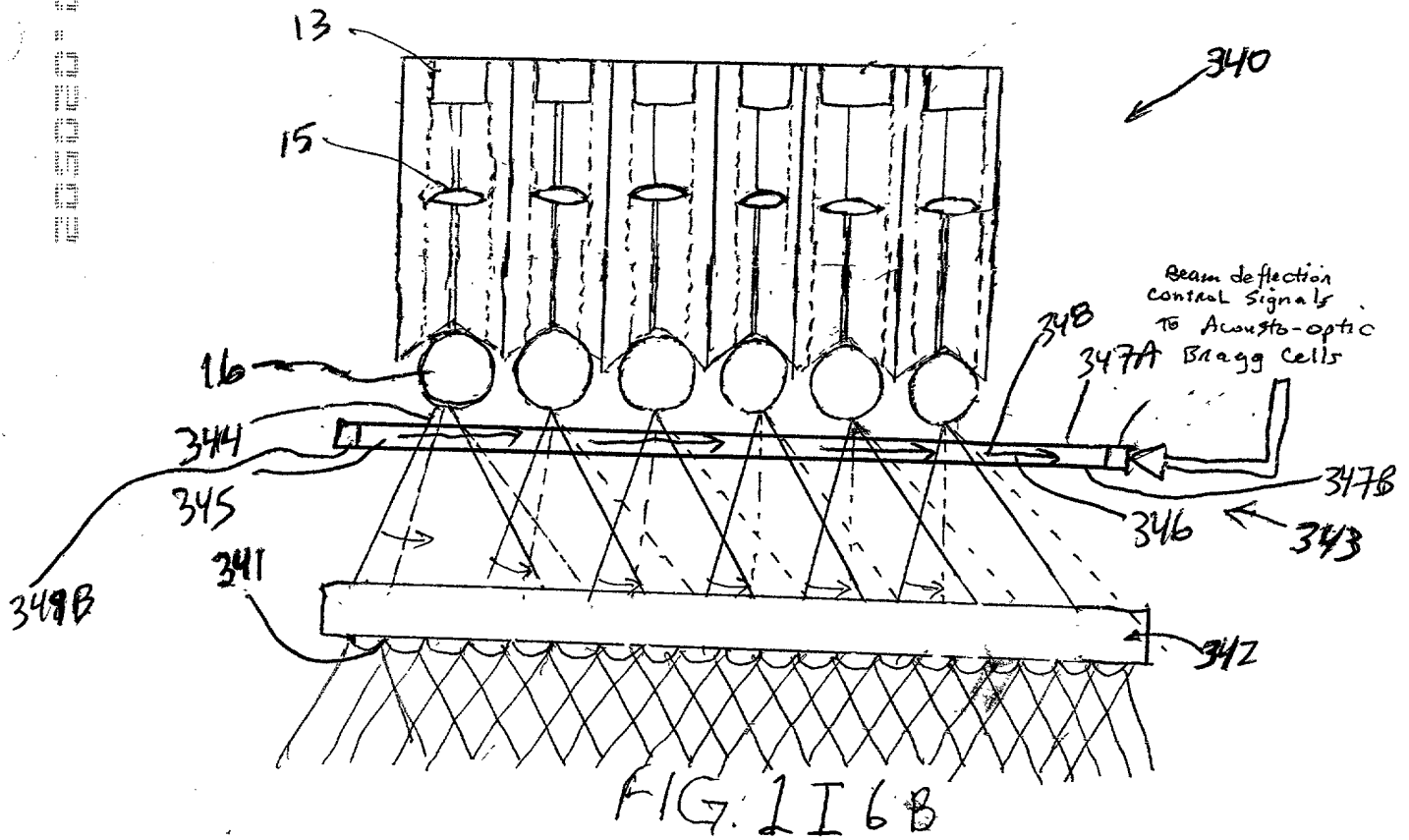
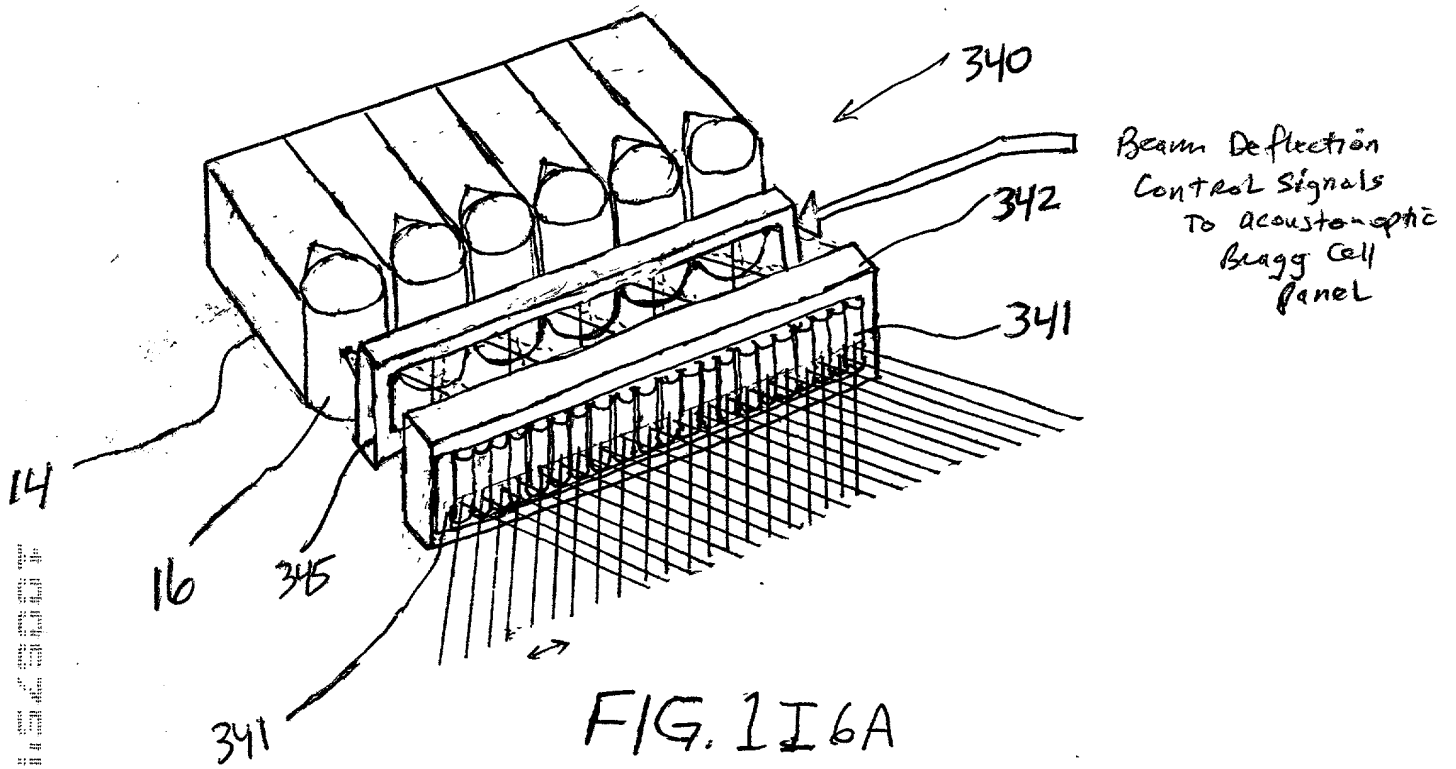
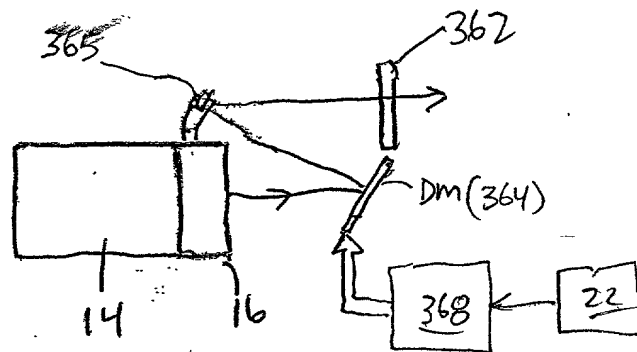
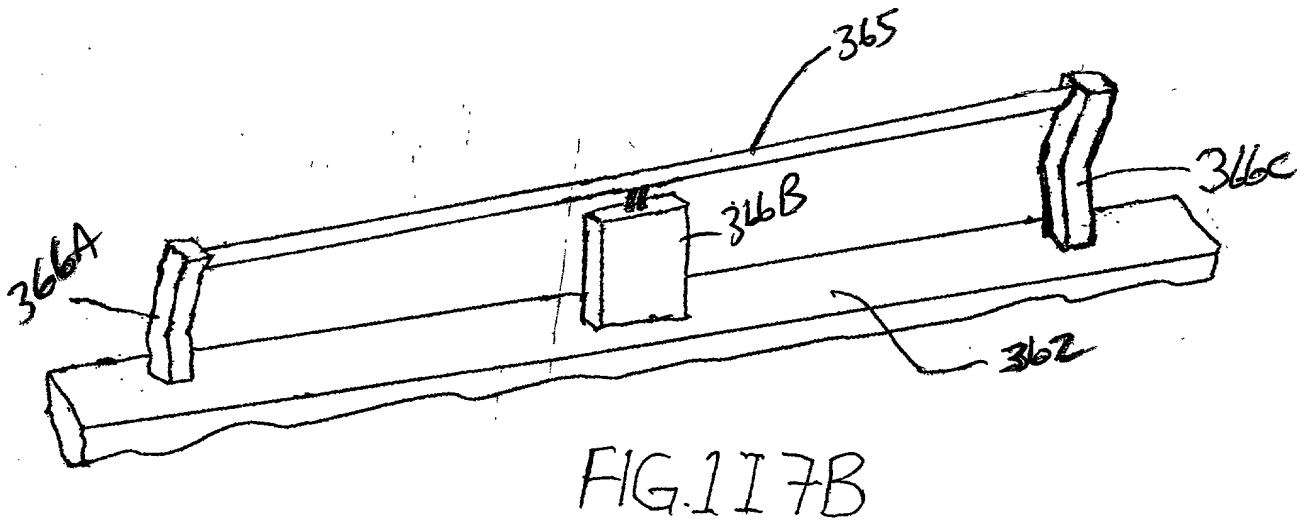
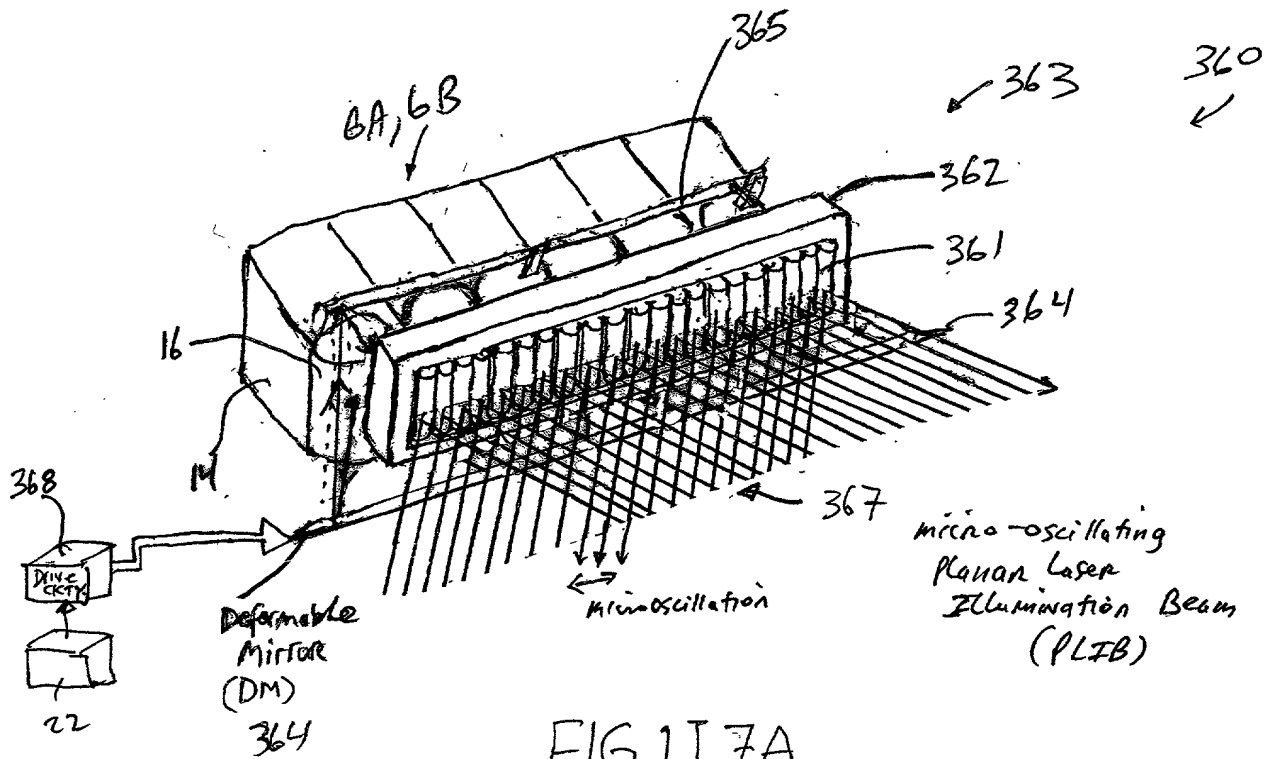


FIG. 1I4D







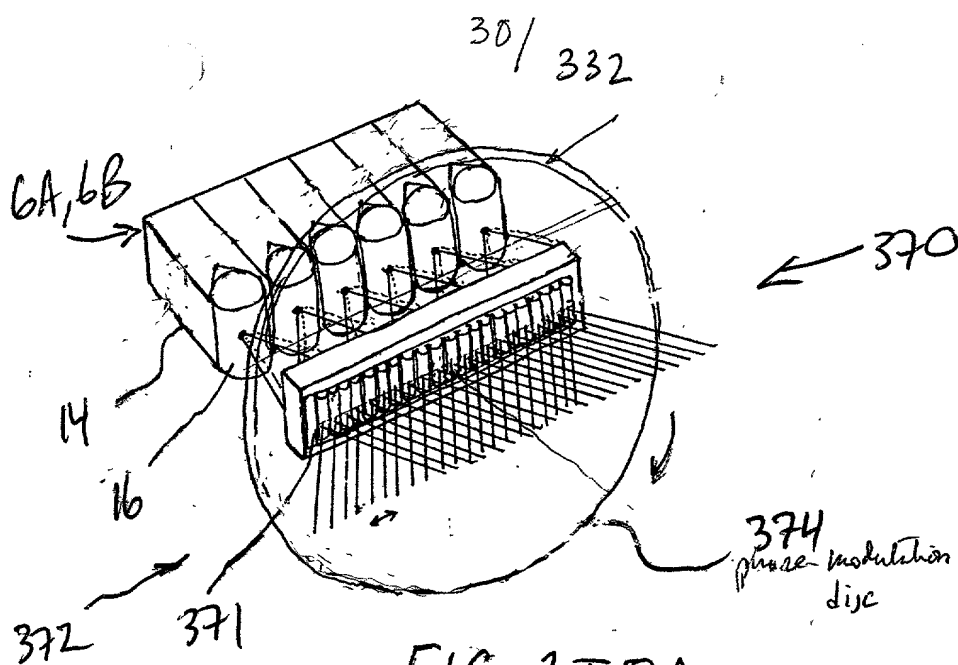


FIG. 1I8A

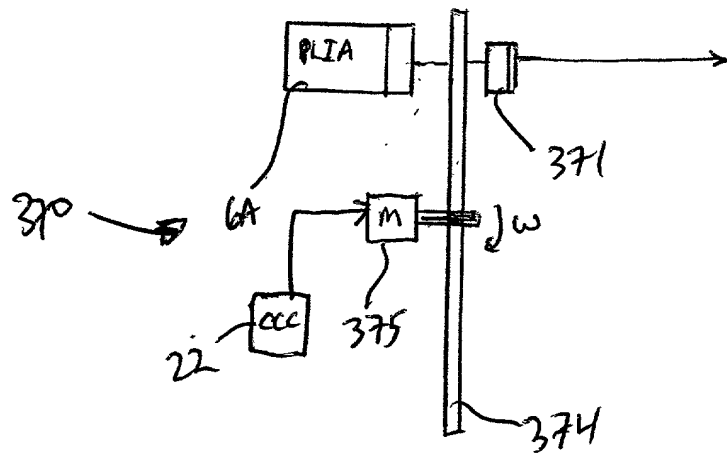


FIG. 1I8B

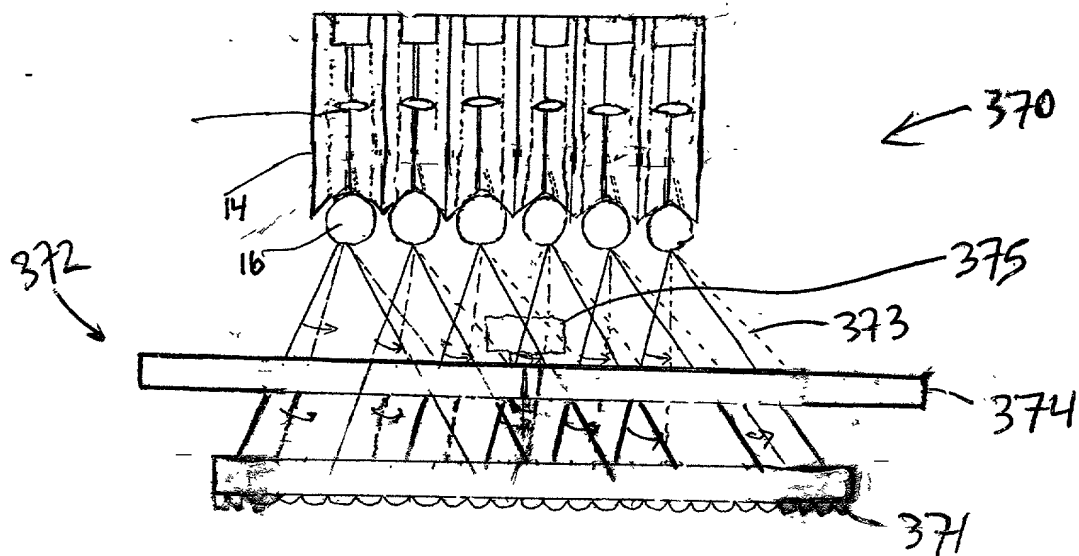


FIG. 1I8C

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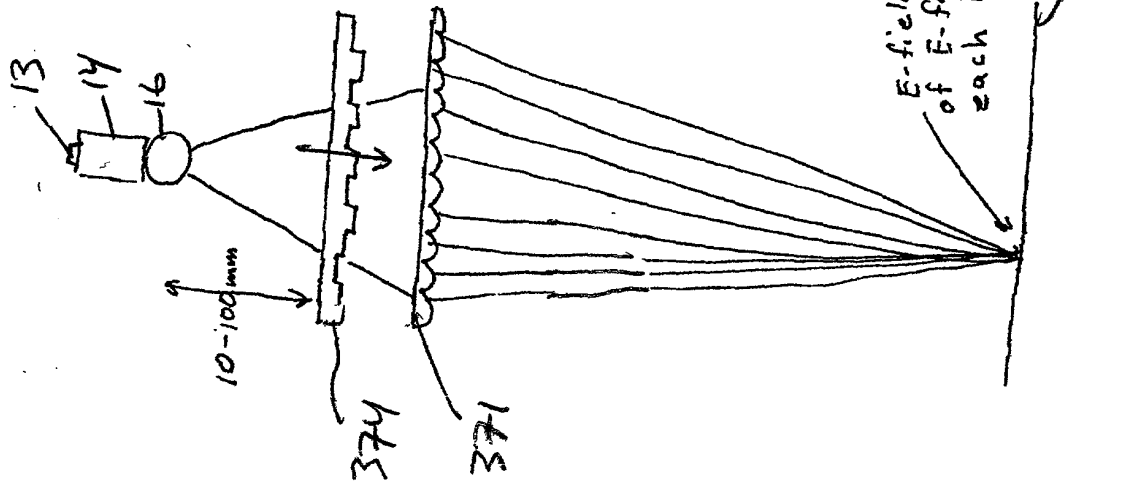


FIG 1I8E

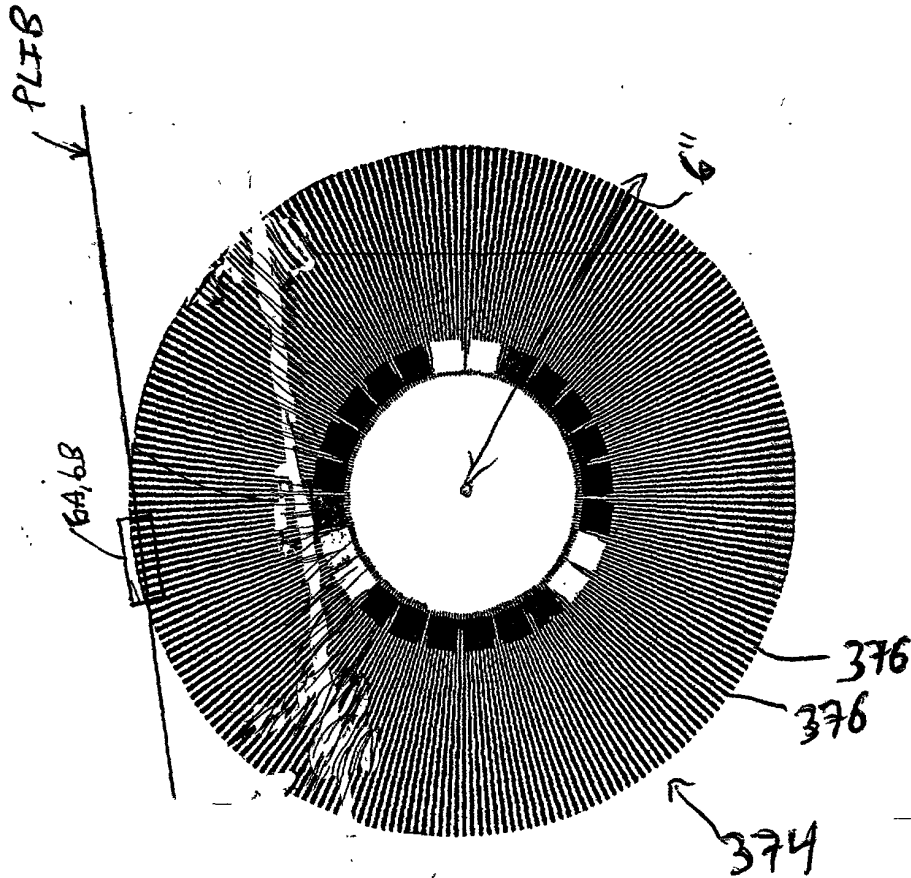
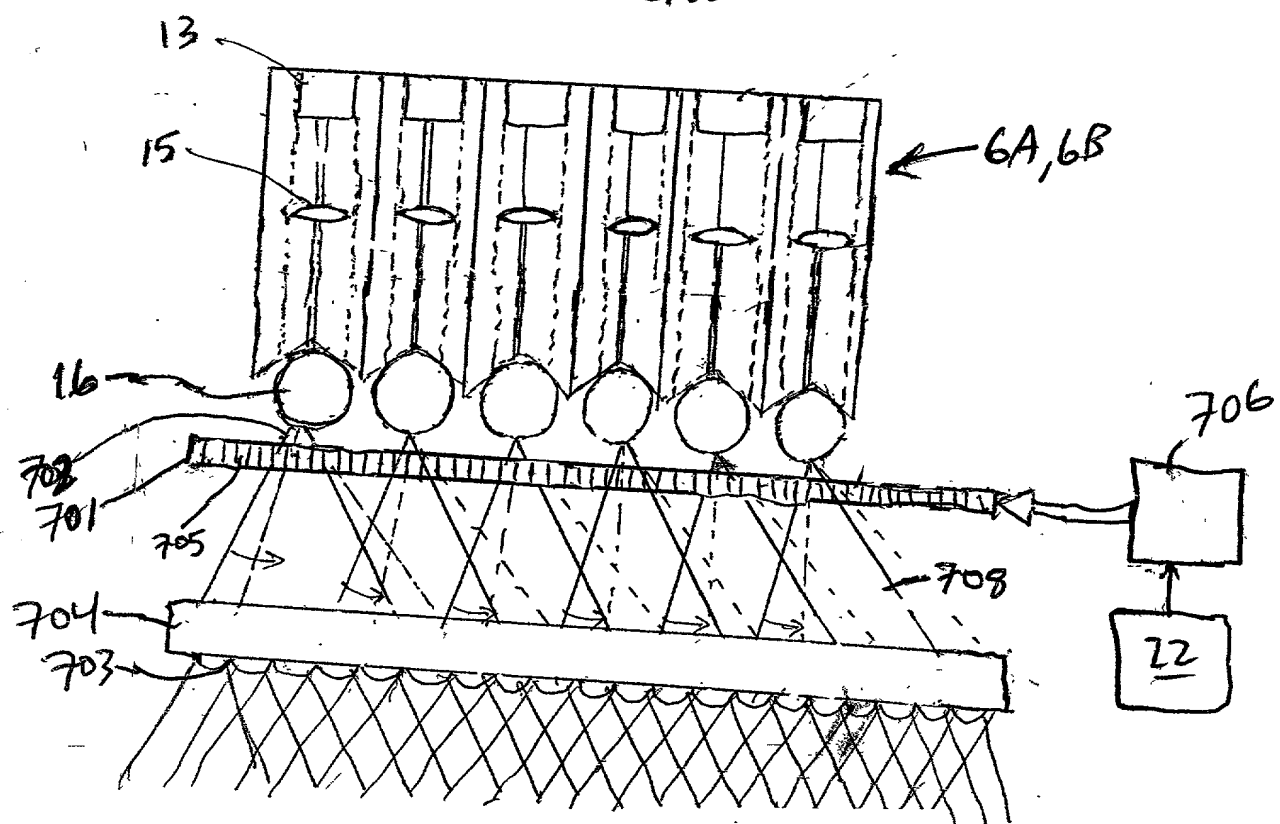
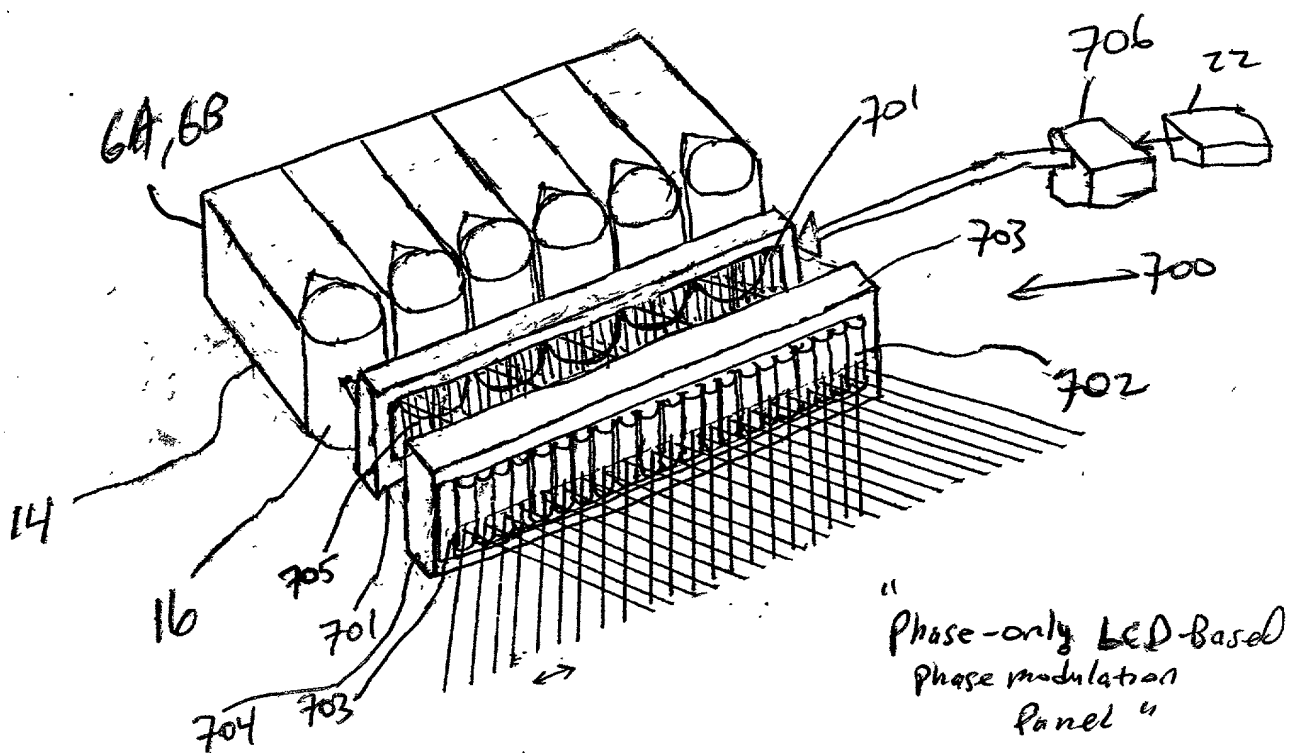


FIG 1I8D



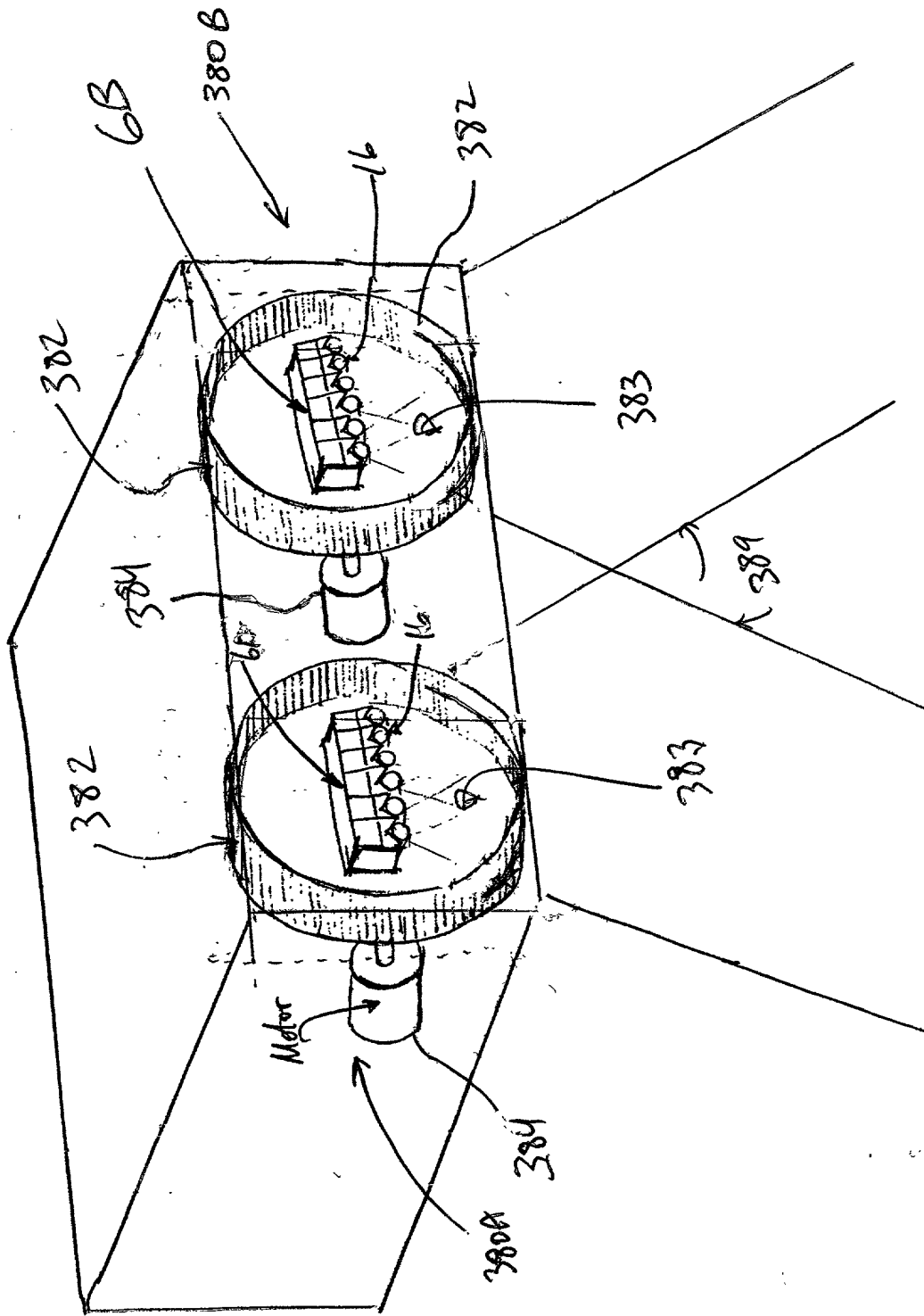


FIG. 1I 9A

Optical specifications:

- 30 cylindrical lens (lines) per linear inch
- focal length = 2.0 millimeters
- diameter of lens carrier carousel ≈ 4 inches
- acrylic material

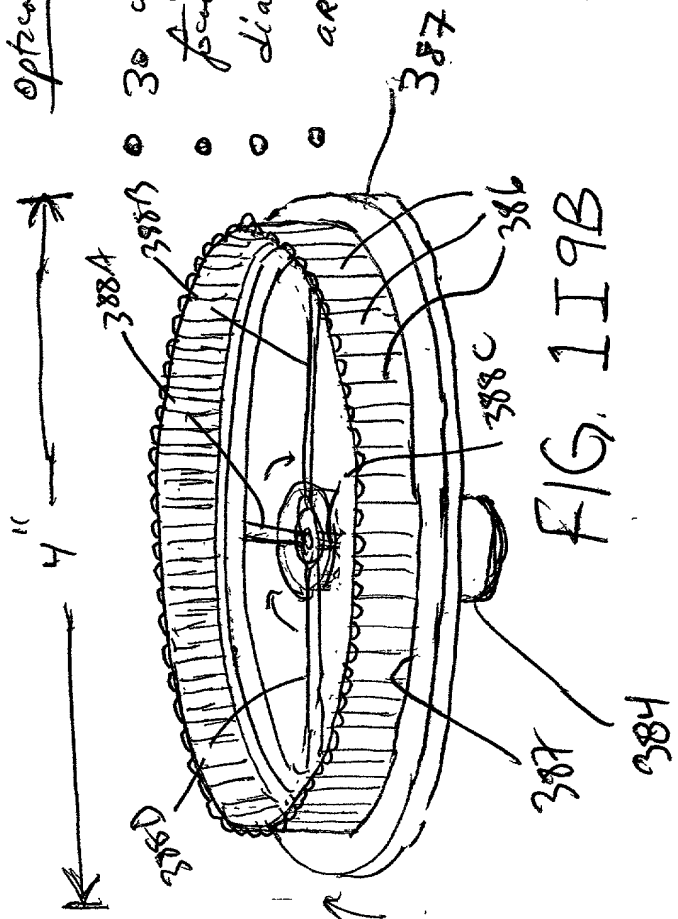


FIG. 1I9B

Optical Specifications:

- 30 cylindrical lens (lenses) per linear inch
- focal length = 2.0 millimeters
- diameter of cylindrical carousel = 4 inches

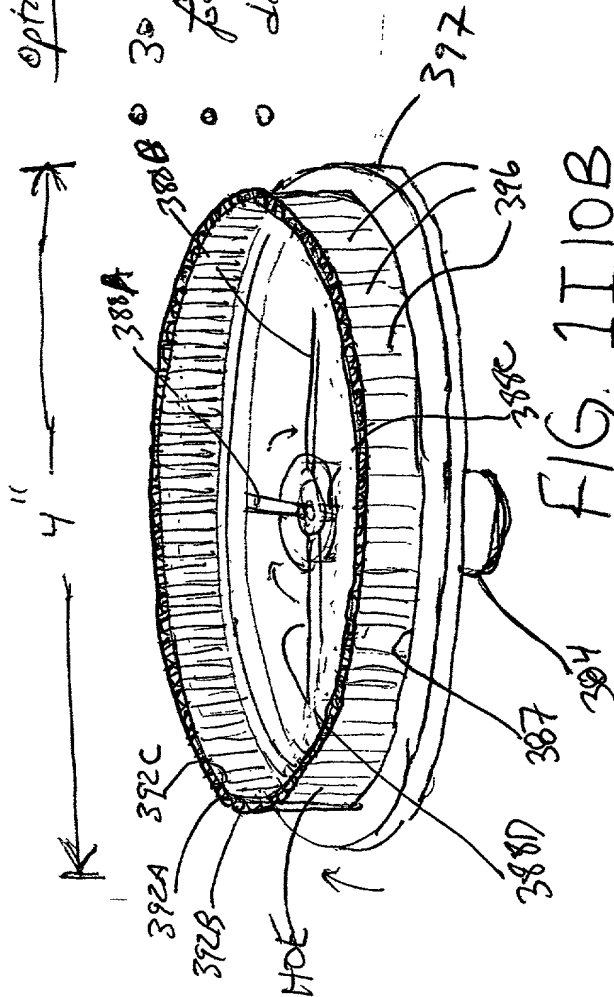


FIG. 1110B

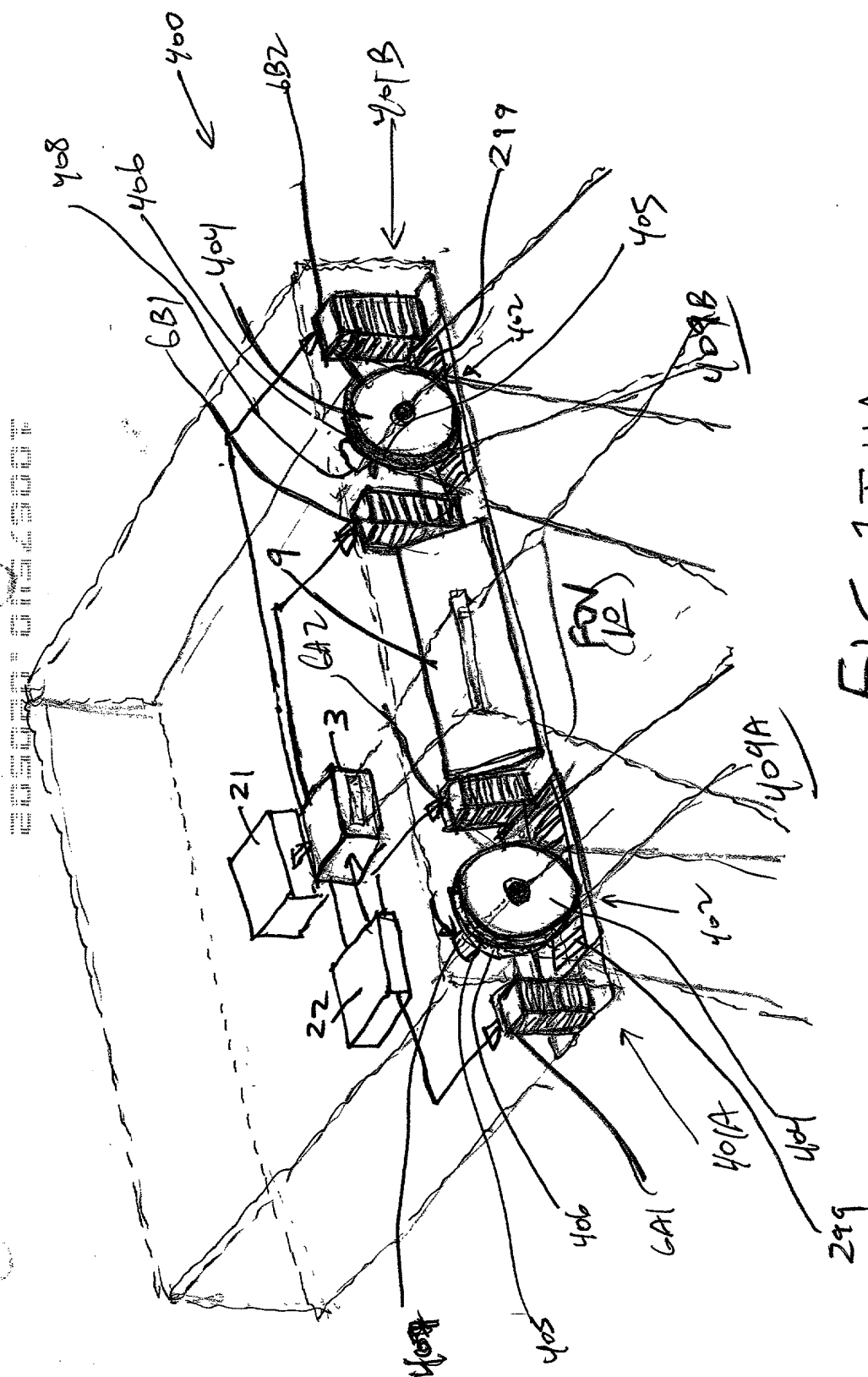


FIG. 111A

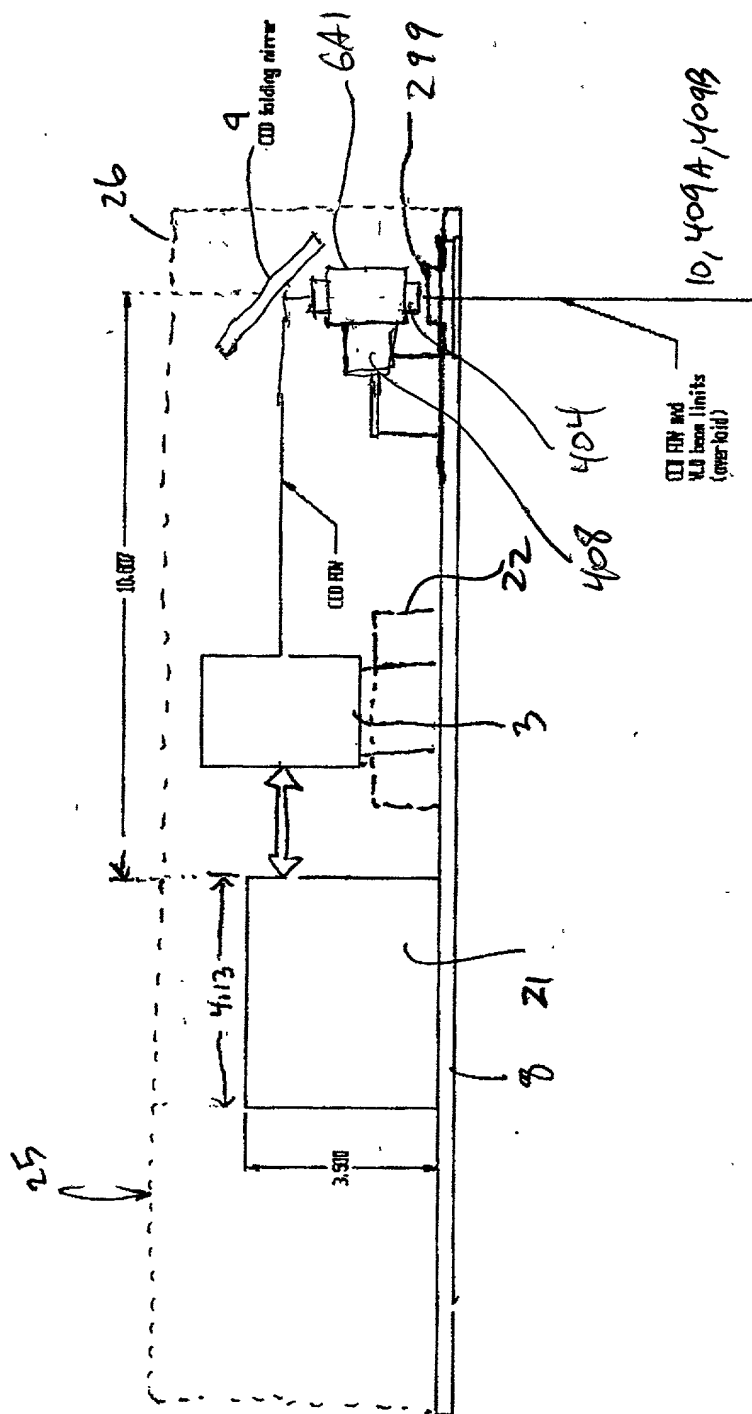


FIG 1I1B

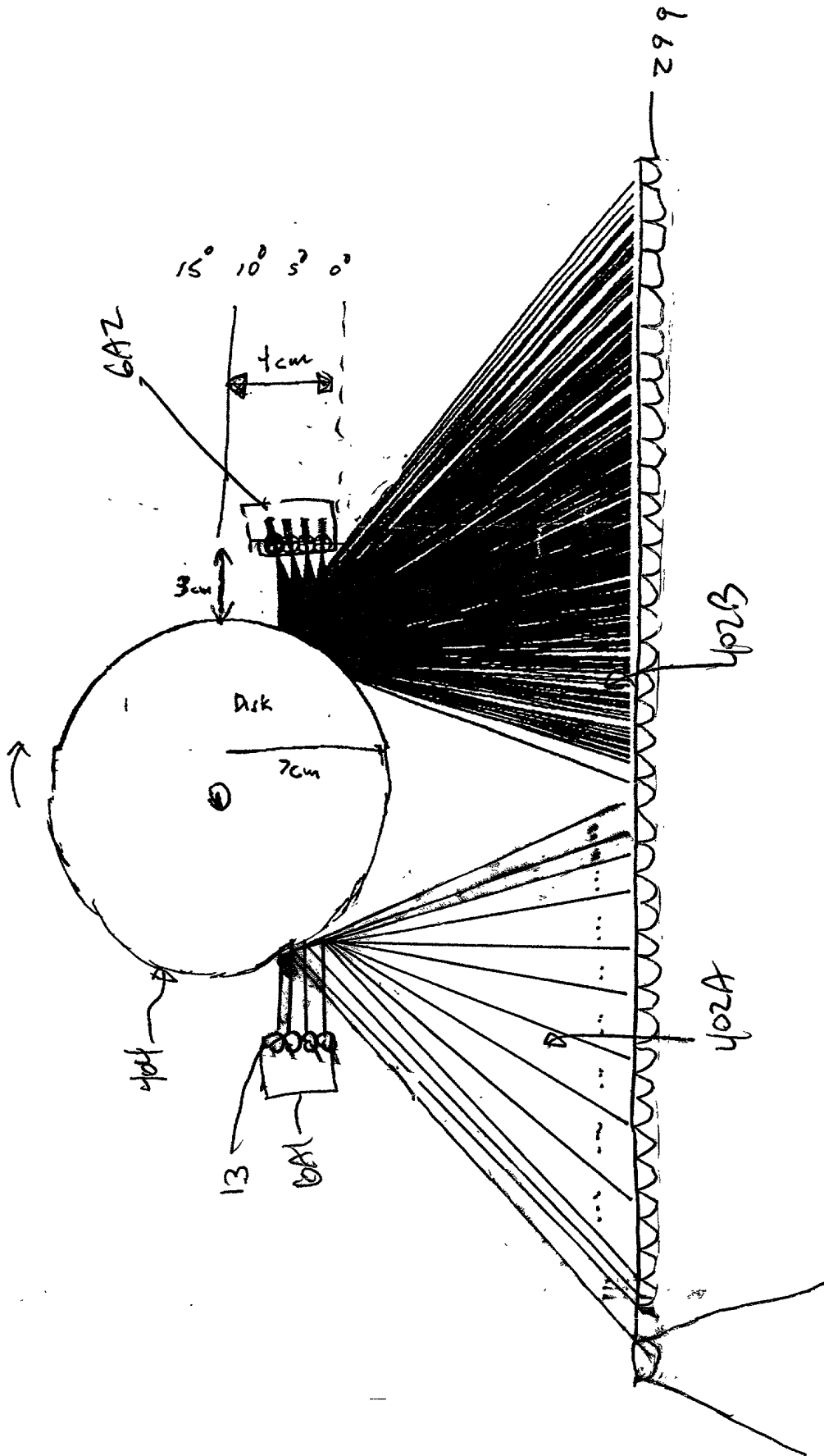


FIG. 1I11C

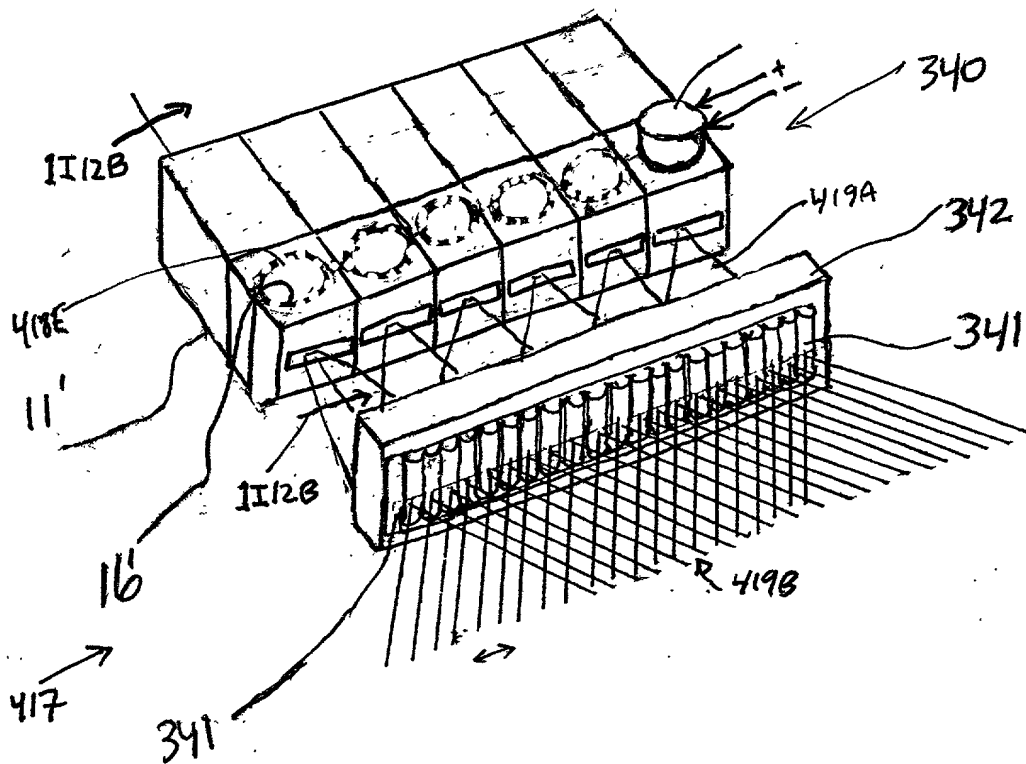


FIG. 1I12A

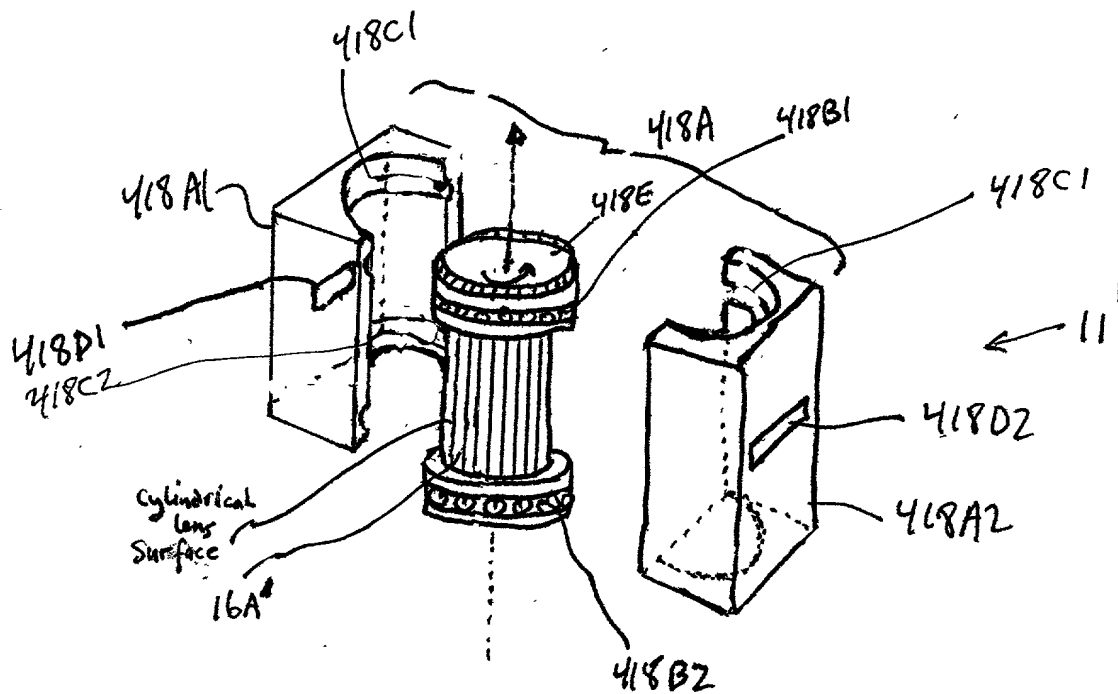


FIG. 1I12B

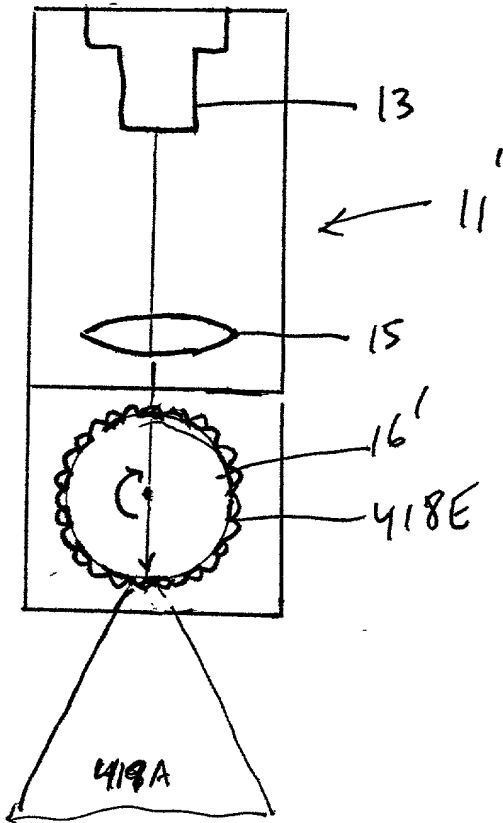


FIG. 1I12C

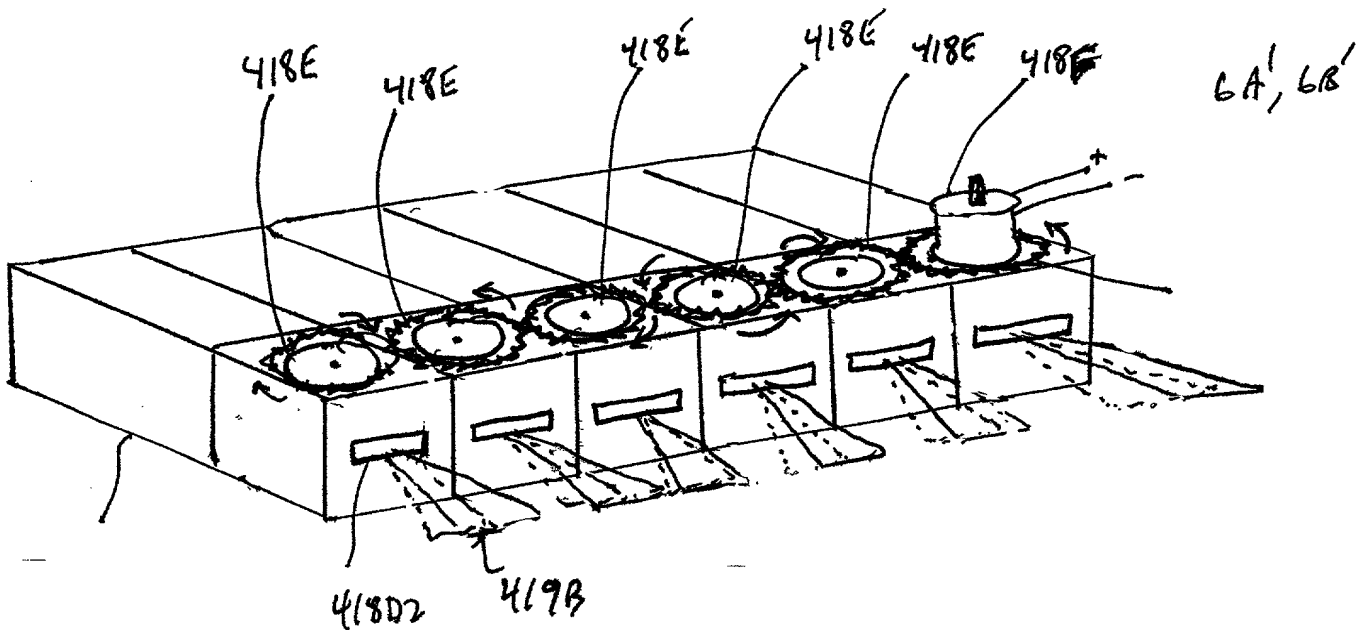


FIG. 1I12D

Second Generalized Method of
Reducing Speckle-Noise Patterns
at Image Detection Array
of the FFD Subsystem (3)

(TIME)

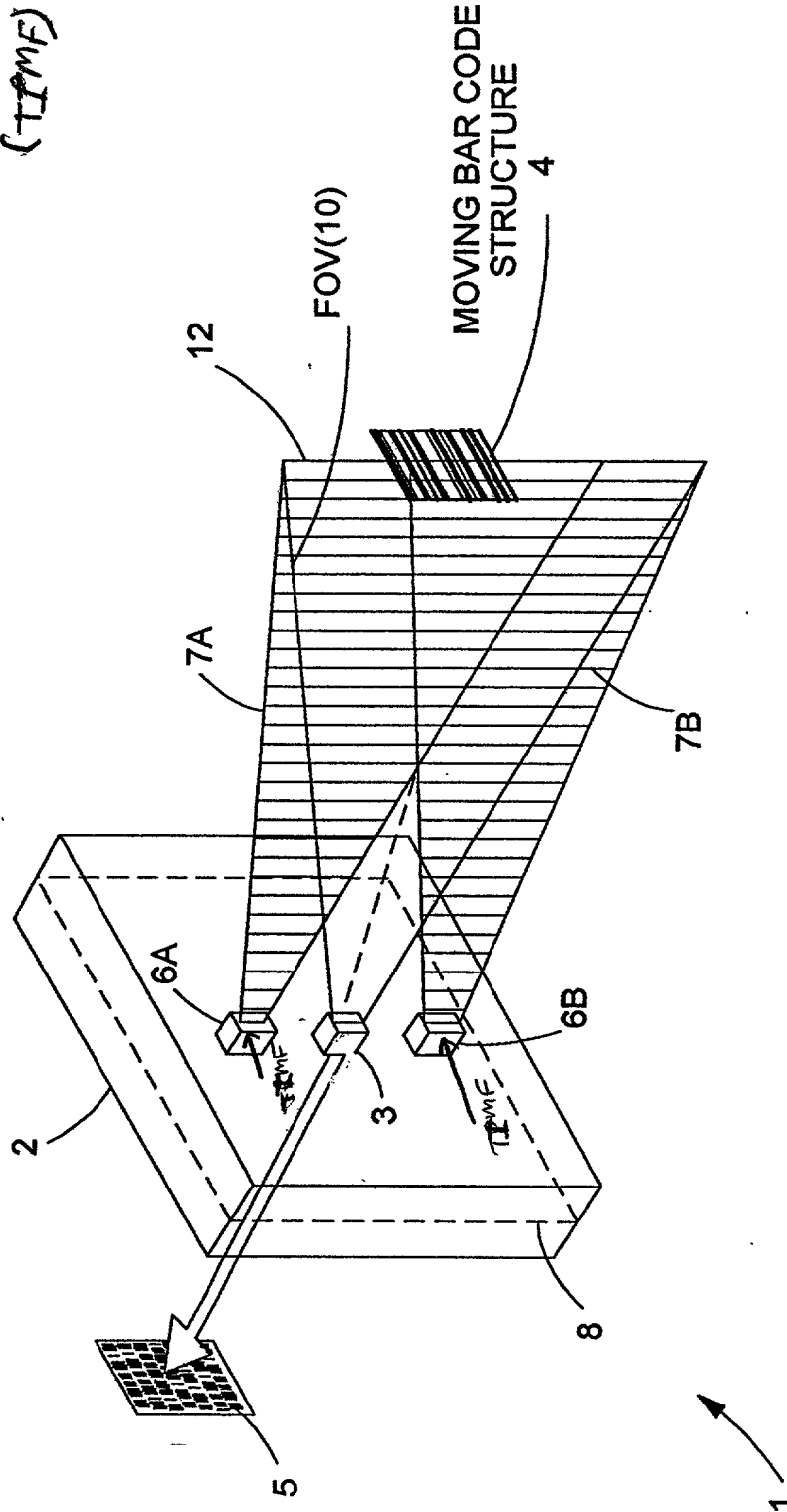


FIG. 1113

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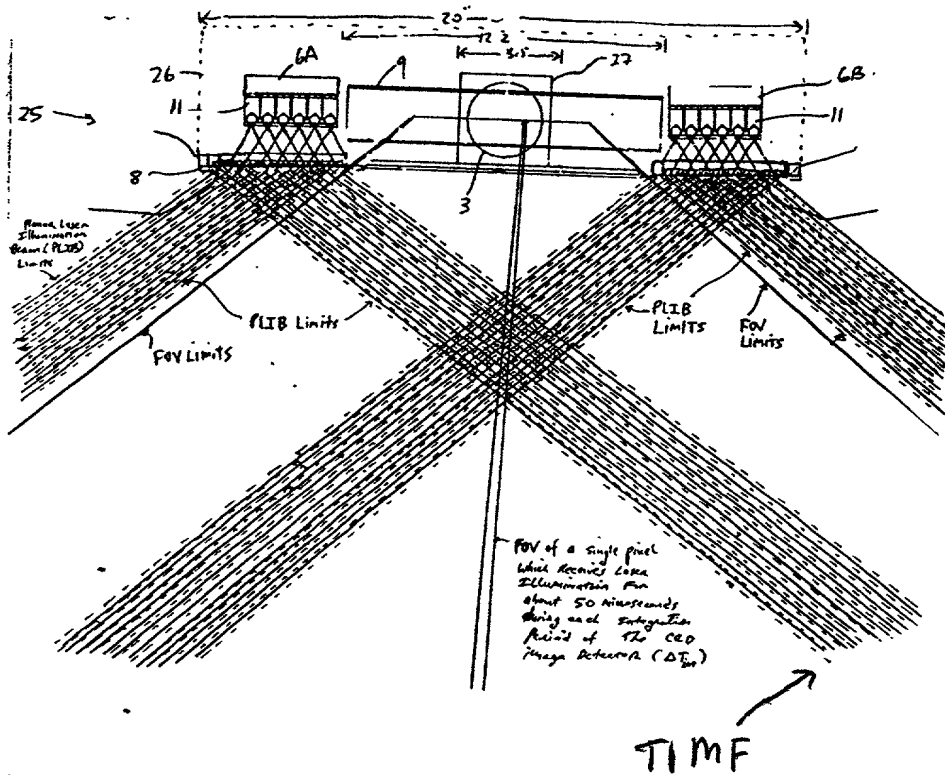


FIG. 1 I 13A

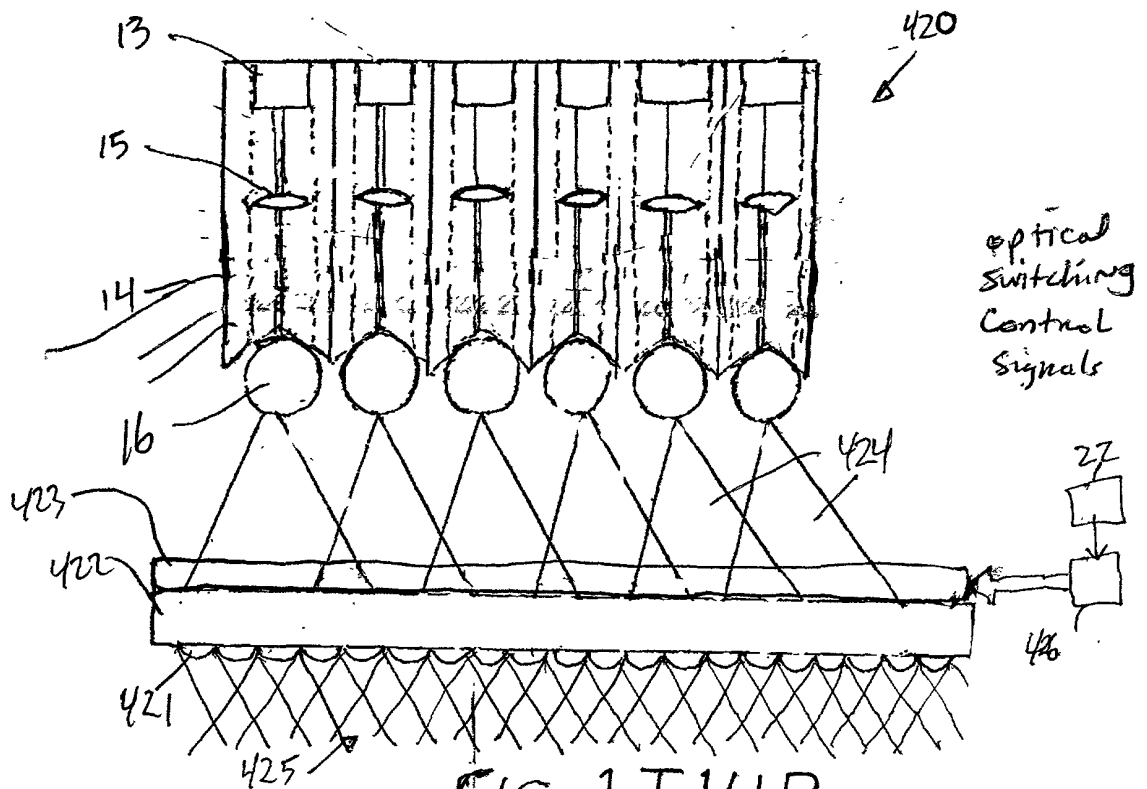
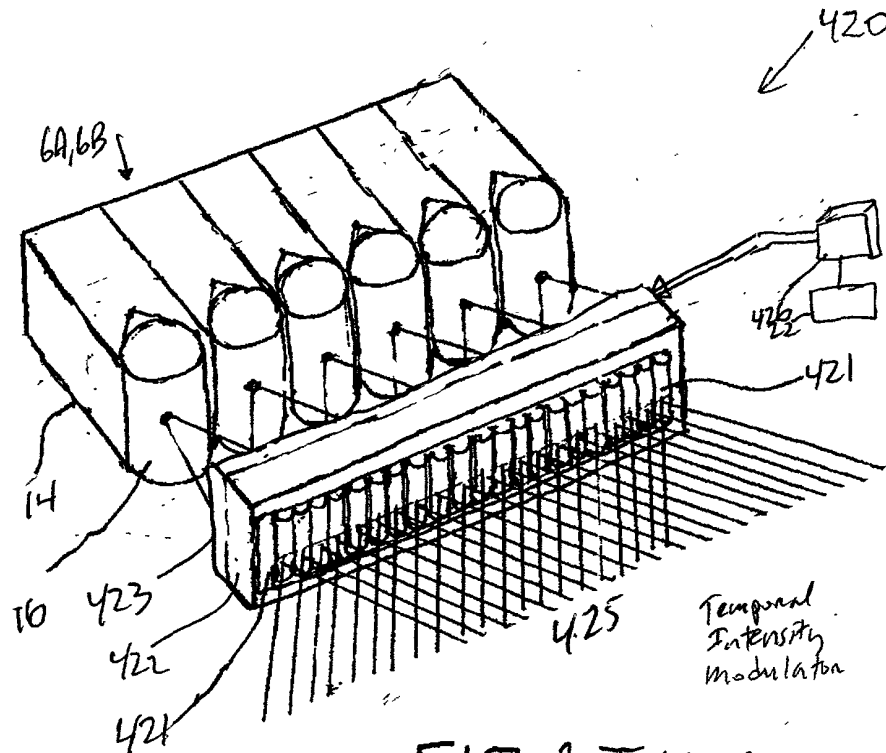
The Second Generalized Speckle-Noise Pattern Reduction Method
Of The Present Invention

Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the temporal intensity of the transmitted PLIB along the planar extent thereof according to a temporal intensity modulation function (TIMF) so as to

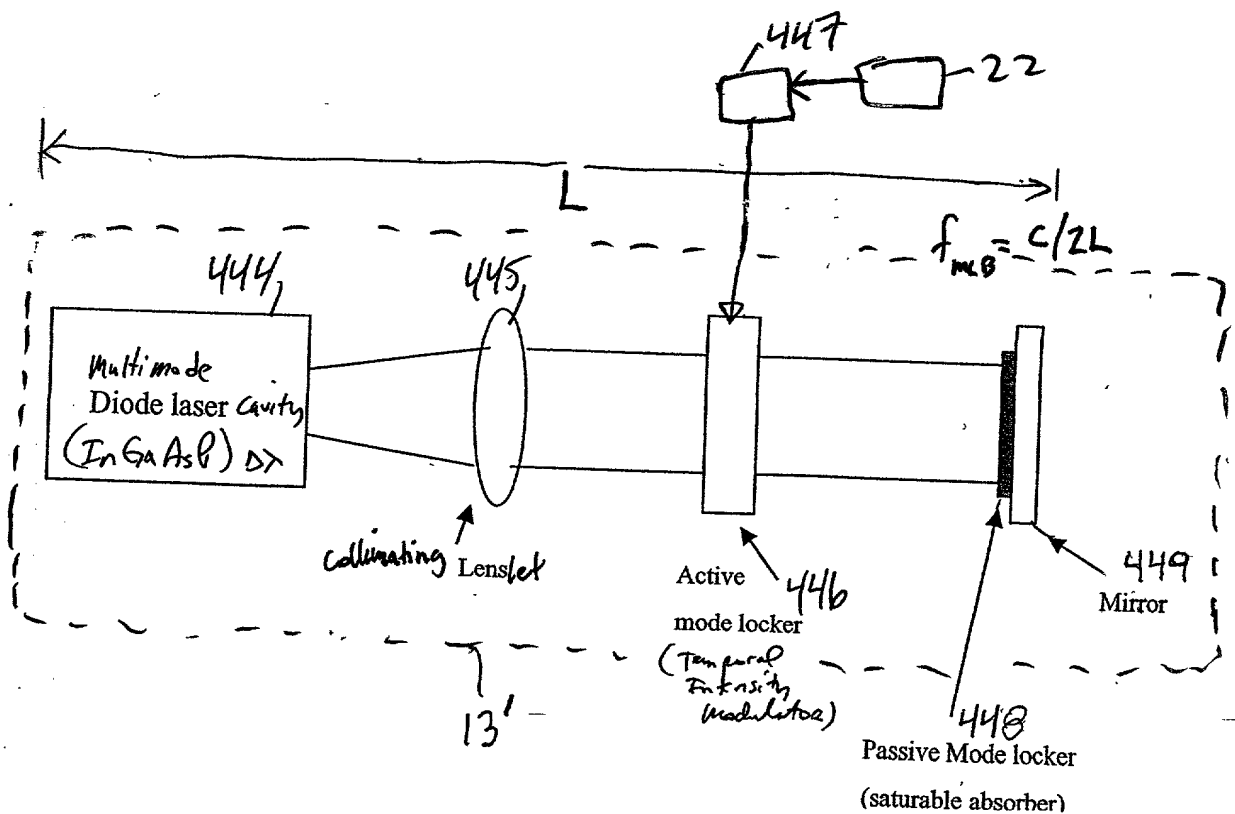
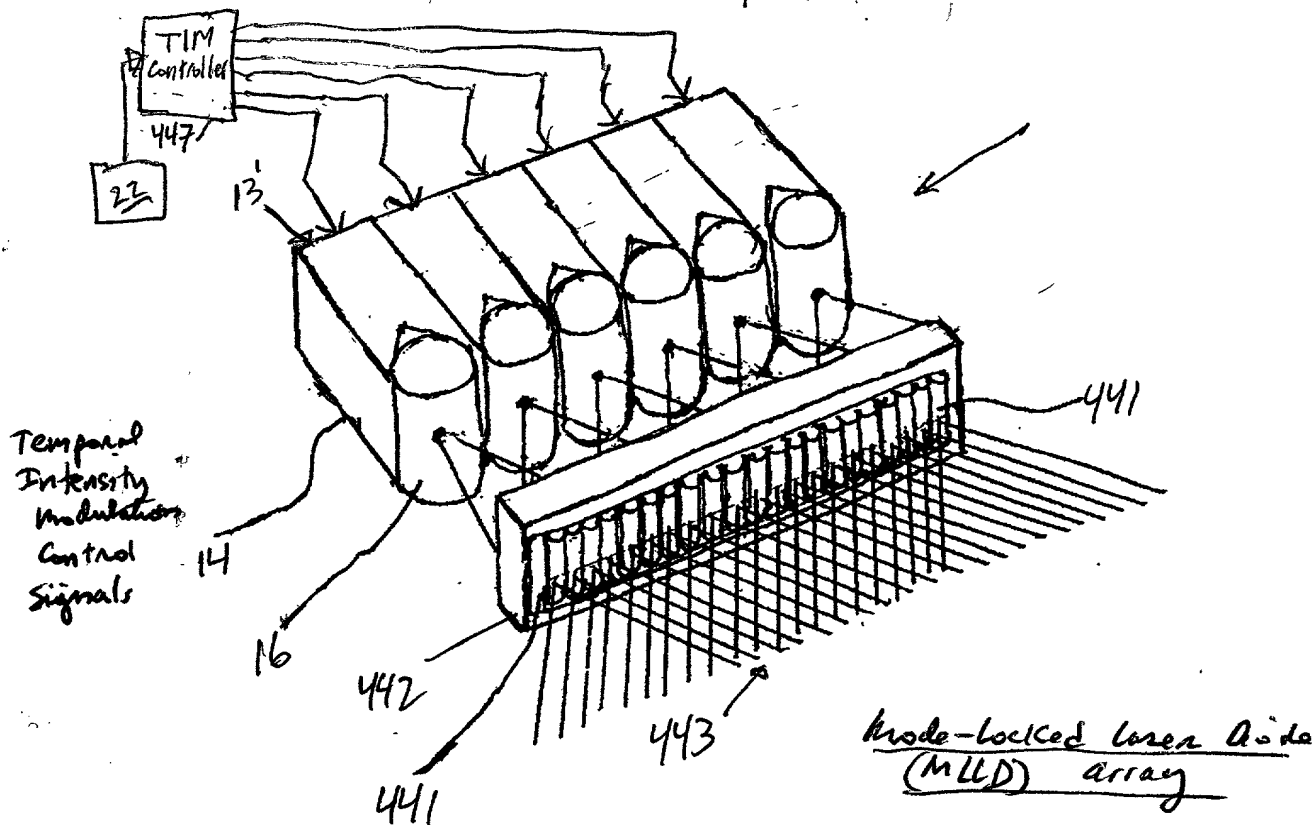
produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce power of the speckle-noise pattern observed at the image detection array.

FIG. 1I/3B



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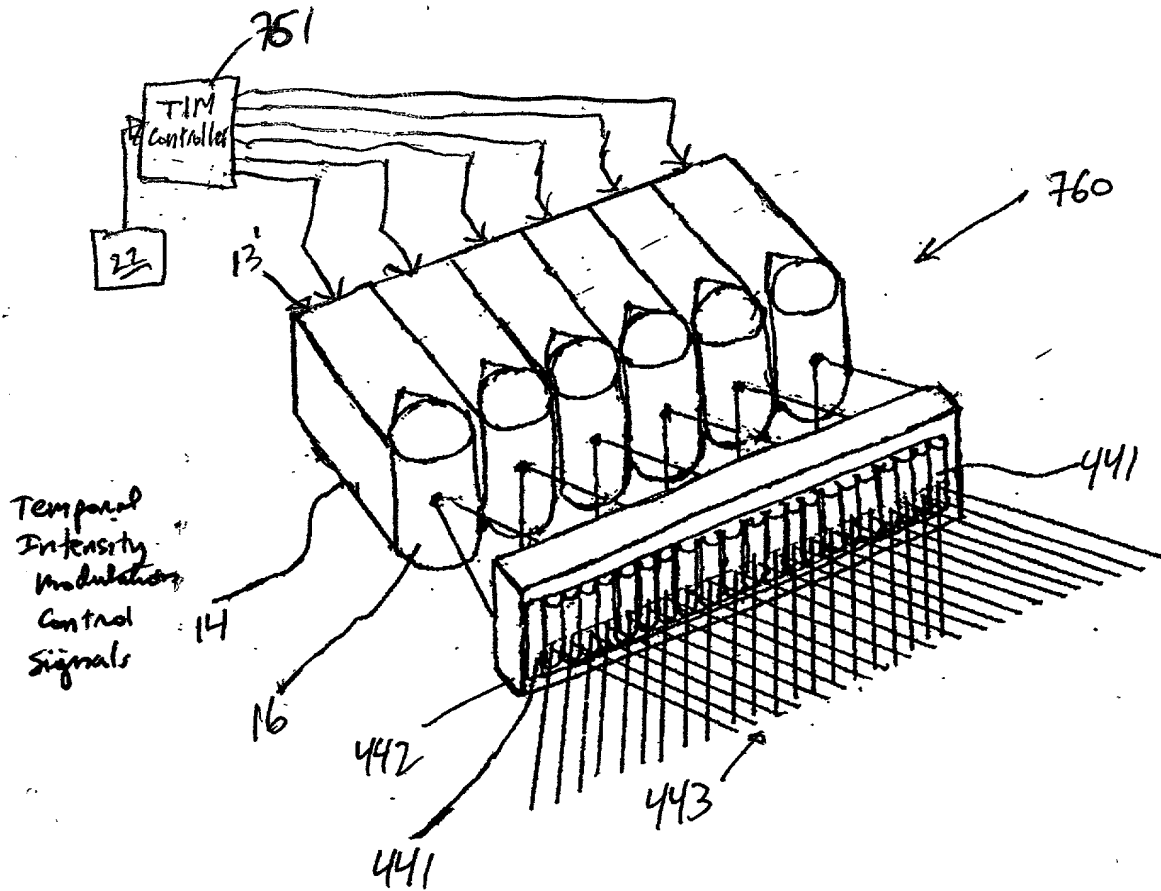


FIG. 1I15C

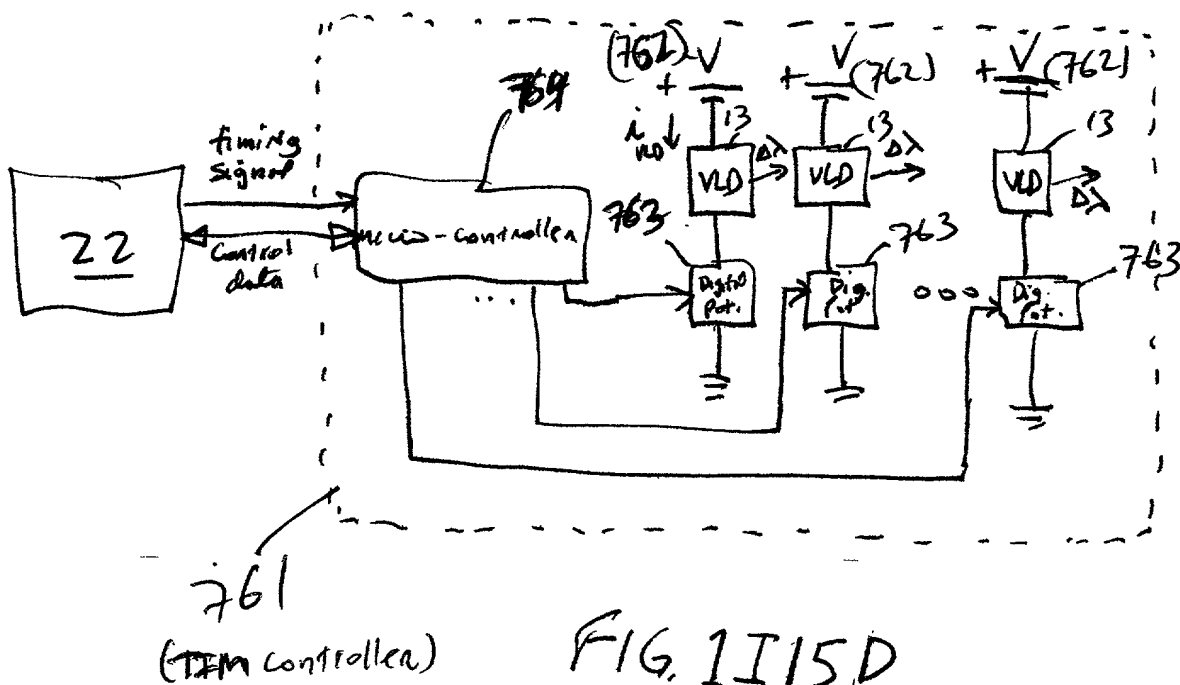


FIG. 1I15D

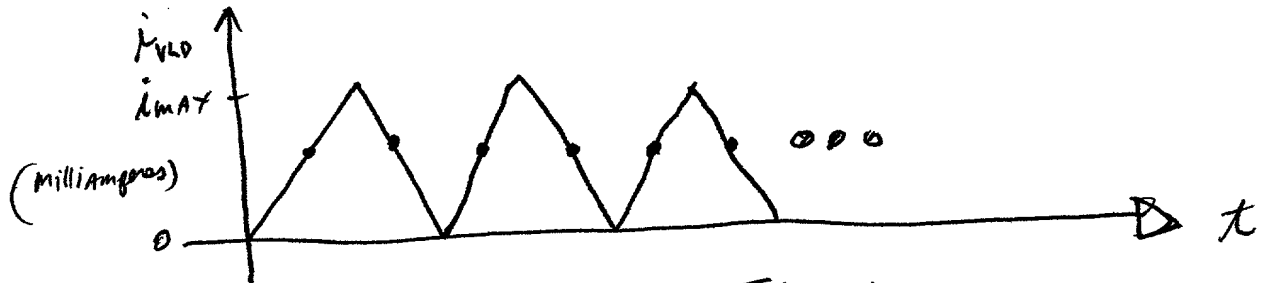


FIG. 1I15E

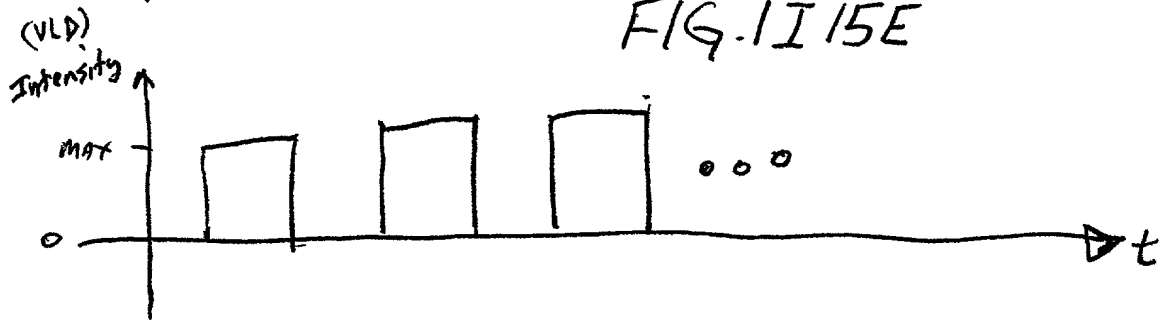


FIG. 1I15E

Third Generalized Method of
Reducing Speckle-Noise Patterns
at Image Detection Array
of the FFD Subsystem (3)

(TIME)

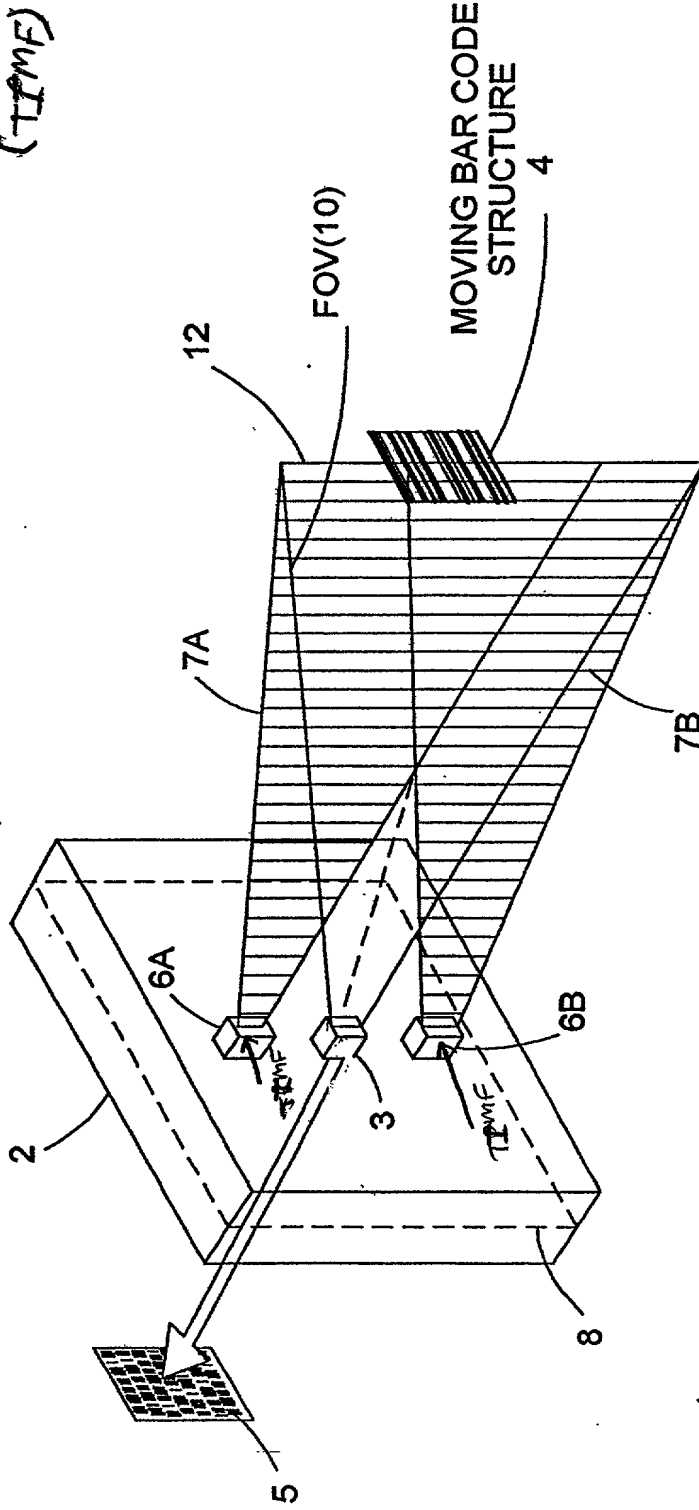
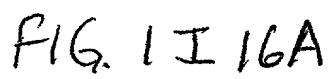


FIG. 1I 16



Third Generalized Speckle-Noise Pattern Reduction Method
Of The Present Invention

Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the temporal *phase* of the transmitted PLIB ~~along the planar extent thereof~~ according to a *Temporal phase* modulation function (TPMF) so as to:

produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.



Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce power of the speckle-noise pattern observed at the image detection array.

FIG. 1I/6B

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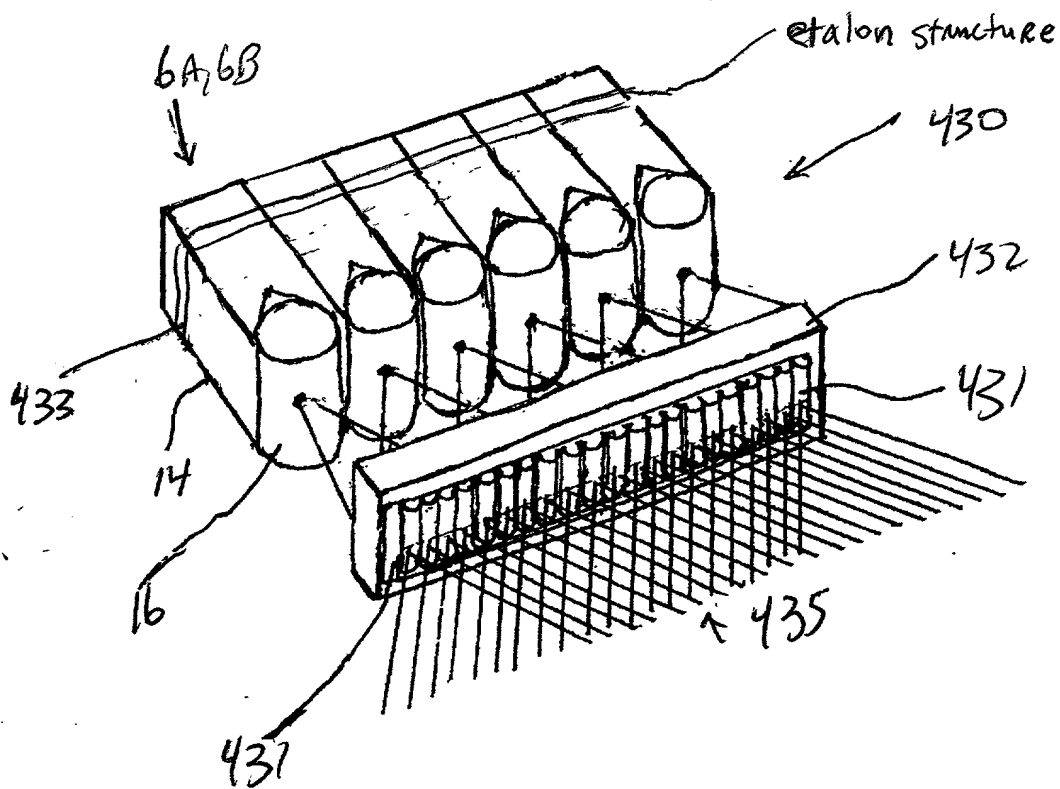


FIG. 1I17A

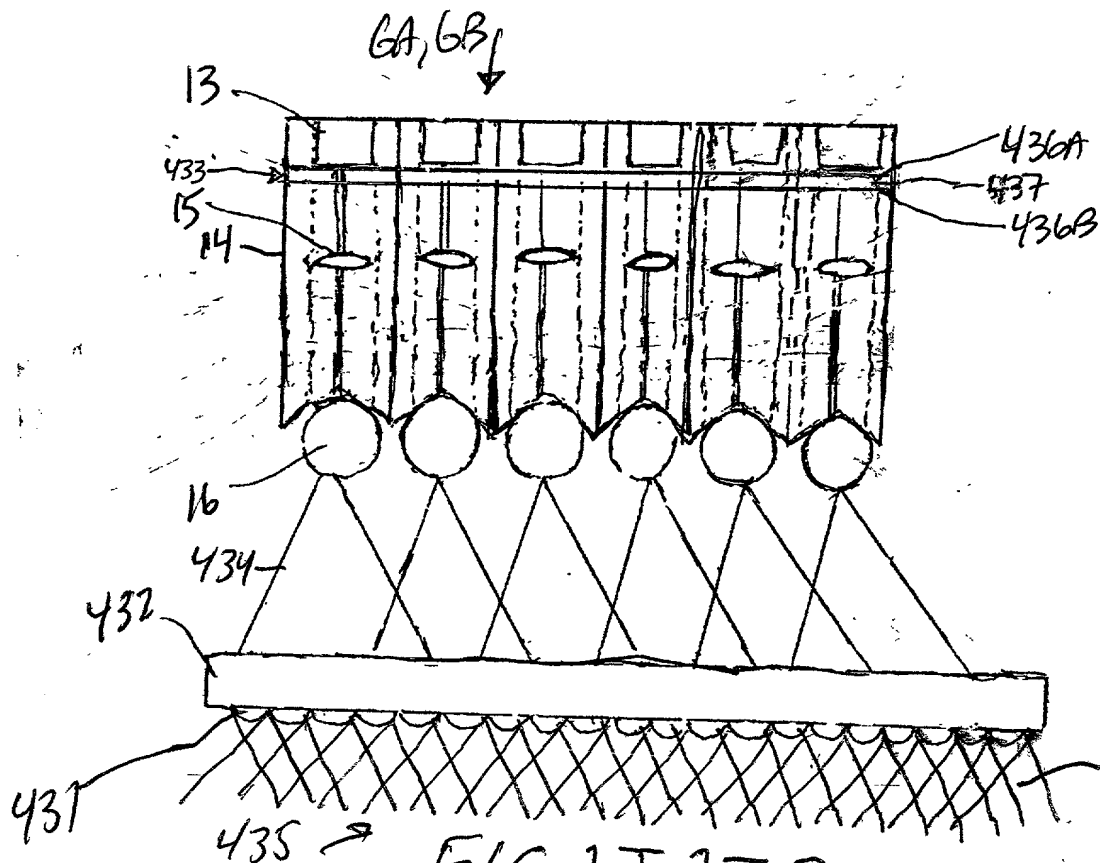
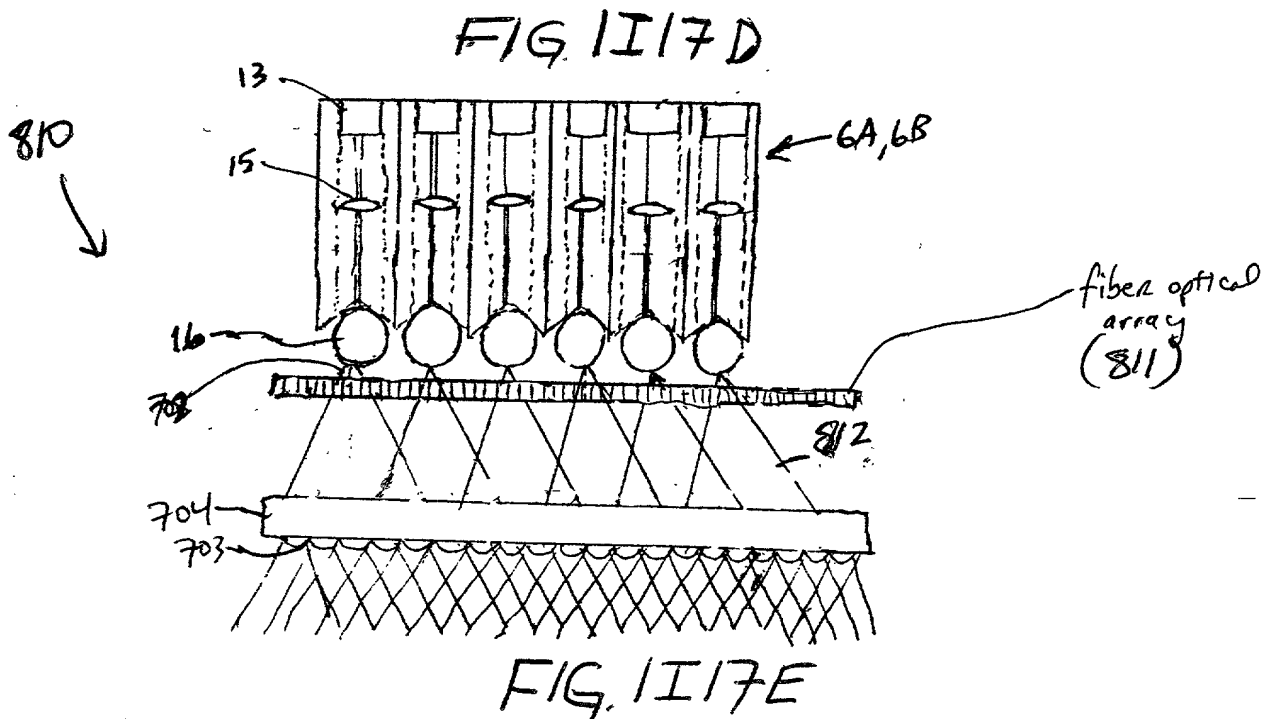
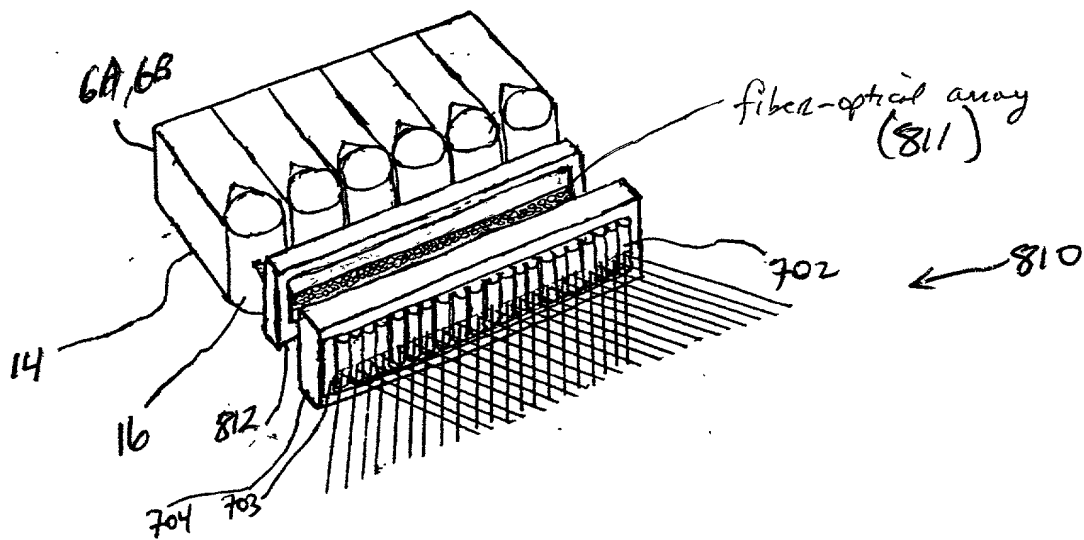
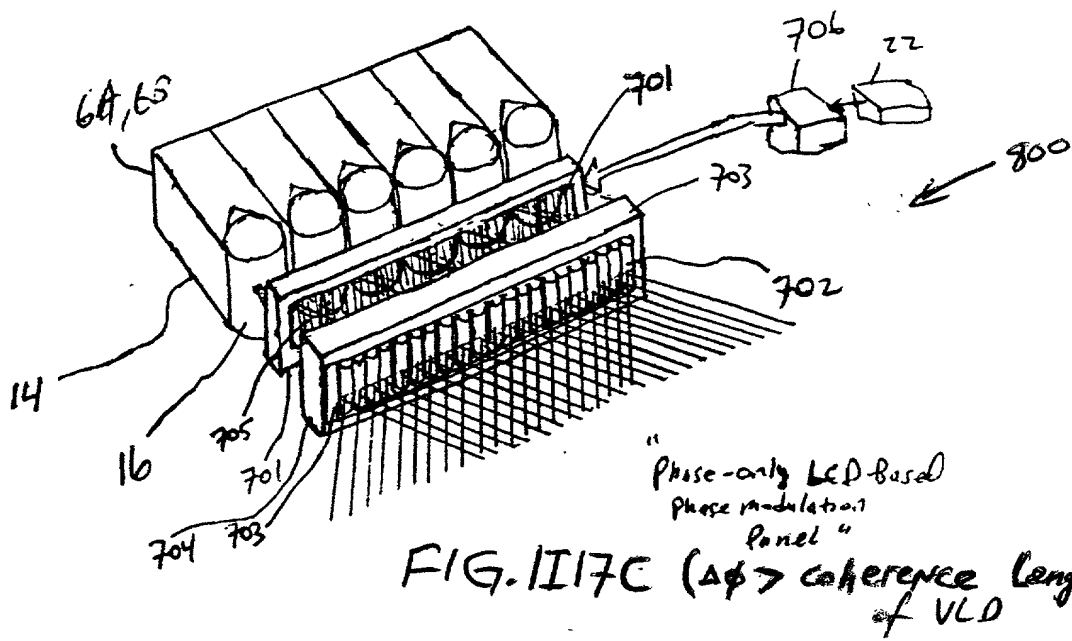


FIG. 1I17B



Fourth Generalized Method of
Reducing Speckle-Noise Patterns
at Image Detection Array
of the FFD Subsystem (3)

(TFMF)

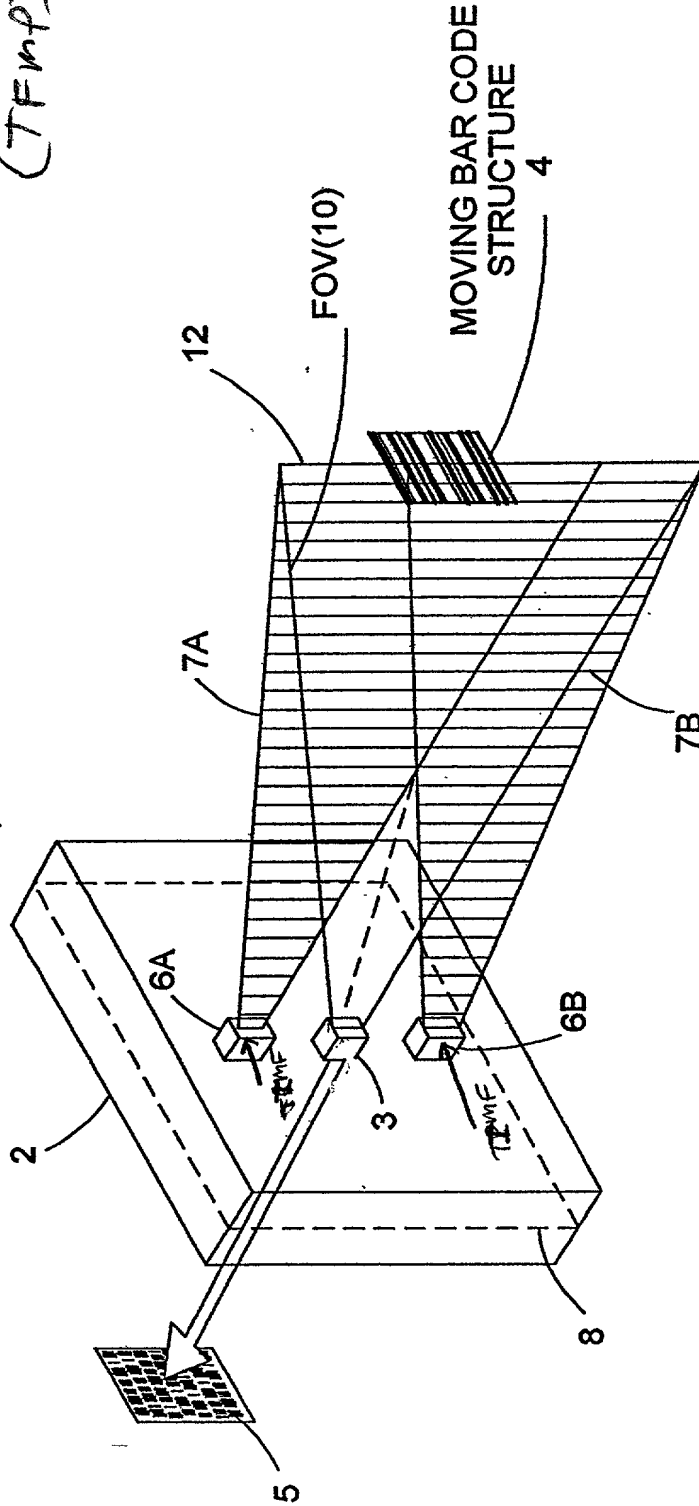


FIG. 1118A

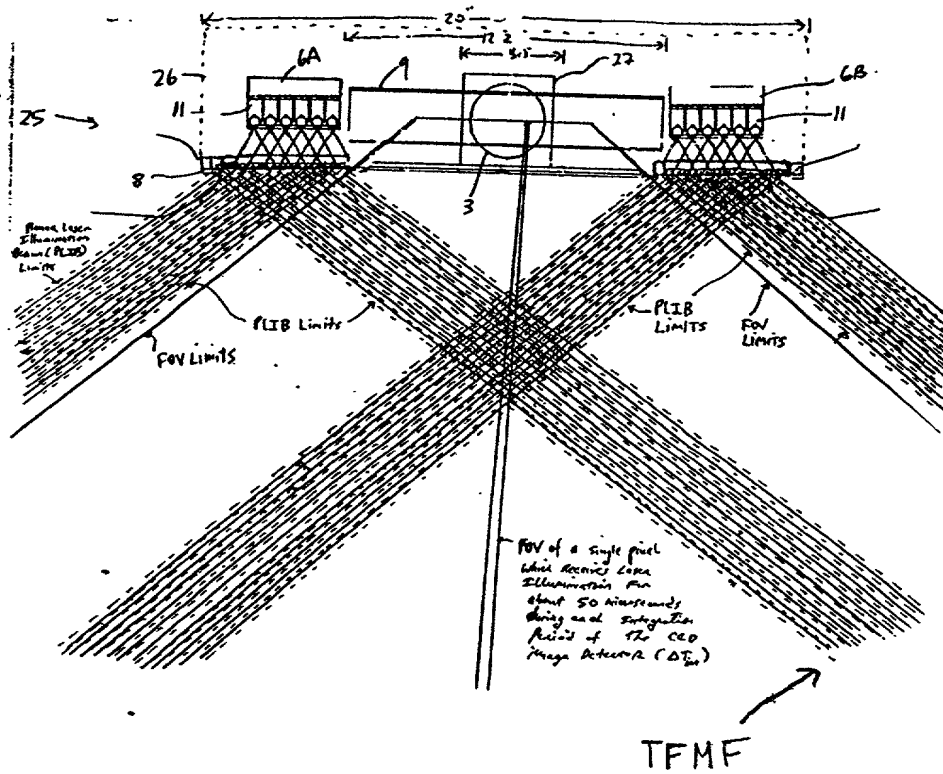


FIG. 1 I 18A

Fourth Generalized Speckle-Noise Pattern Reduction Method
Of The Present Invention

Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the temporal frequency of the transmitted PLIB according to a temporal intensity modulation function (T IMF) so as to ;

produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce power of the speckle-noise pattern observed at the image detection array.

FIG. 1 I 18 B

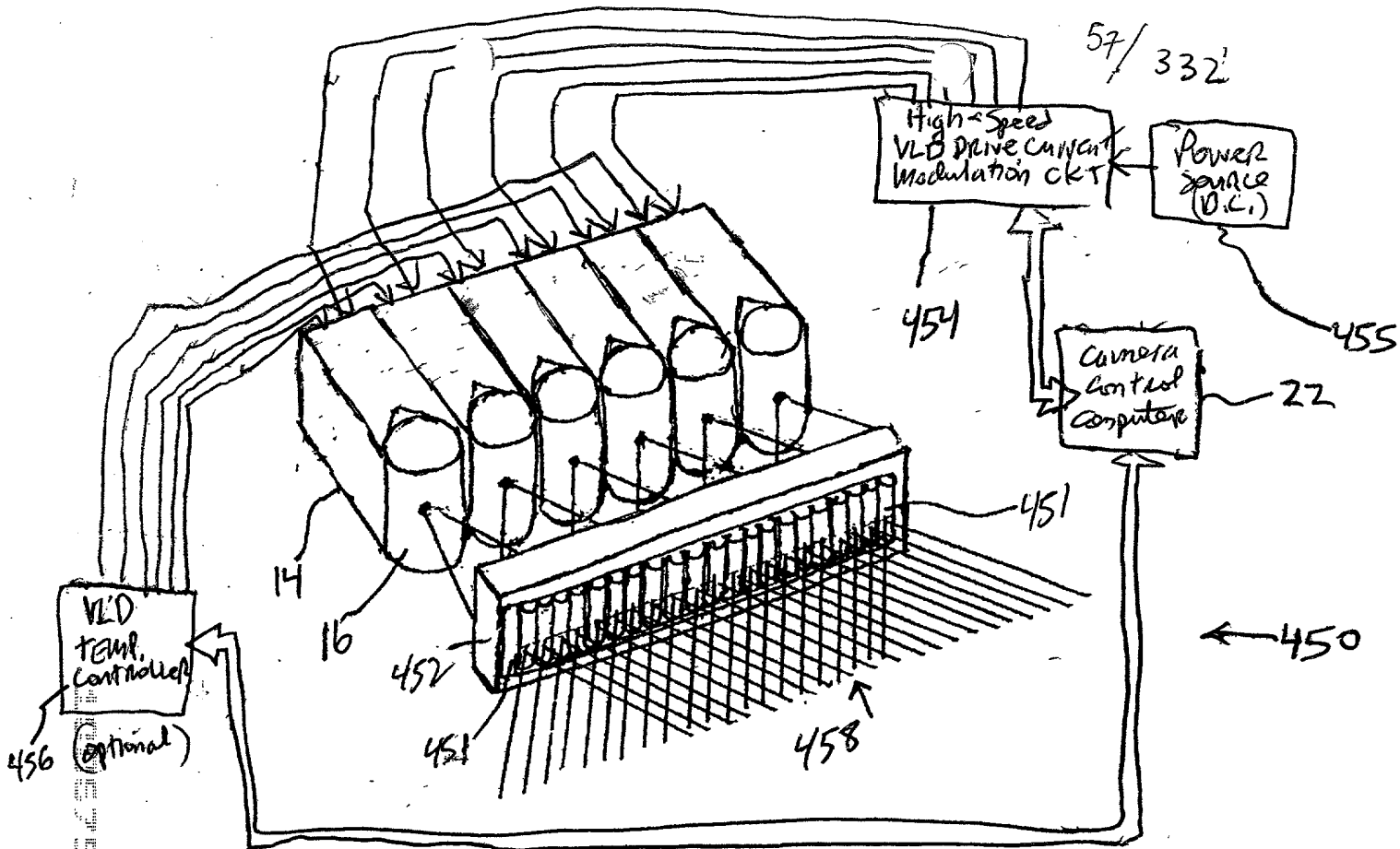
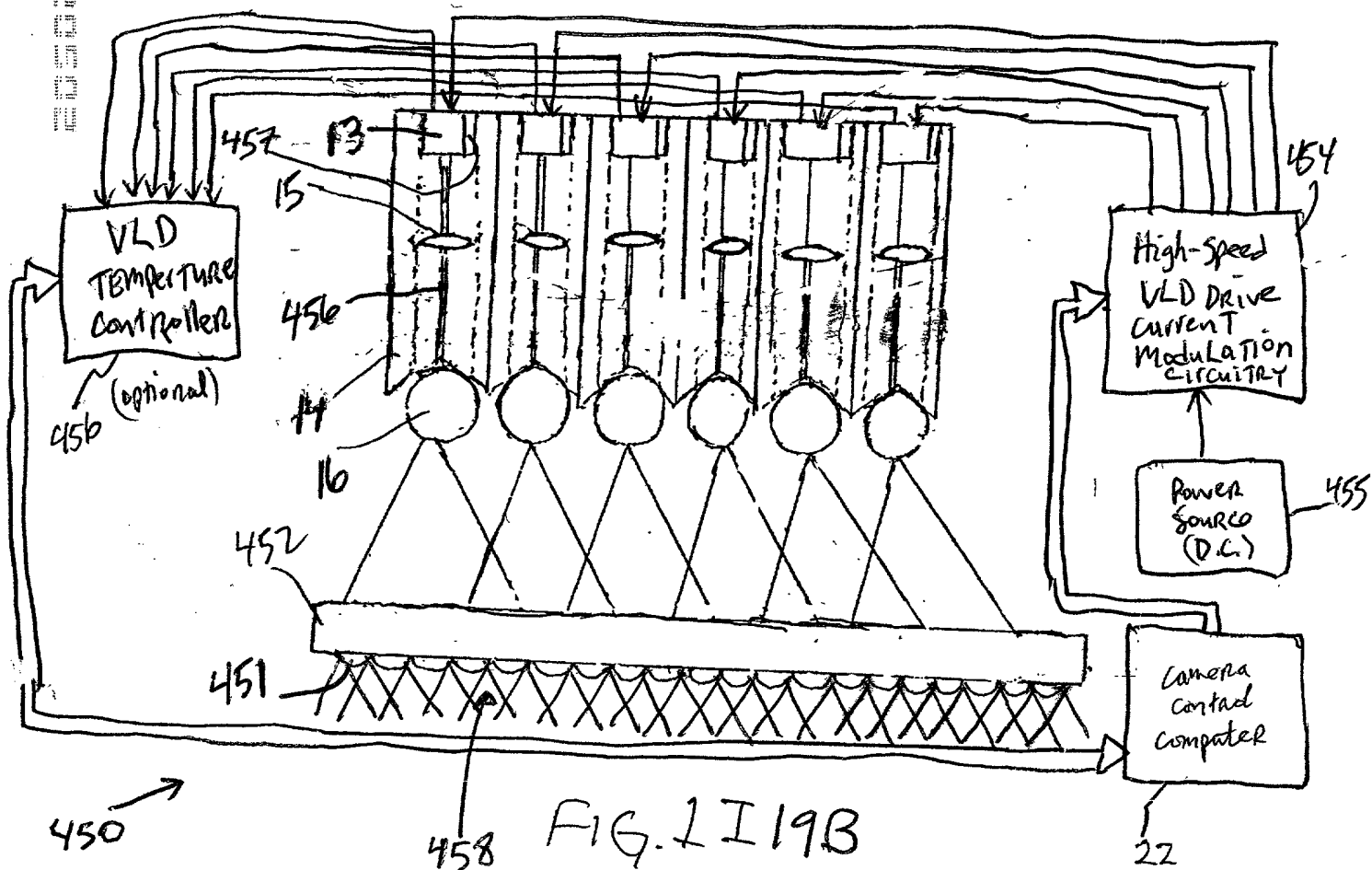


FIG. 1I 19A



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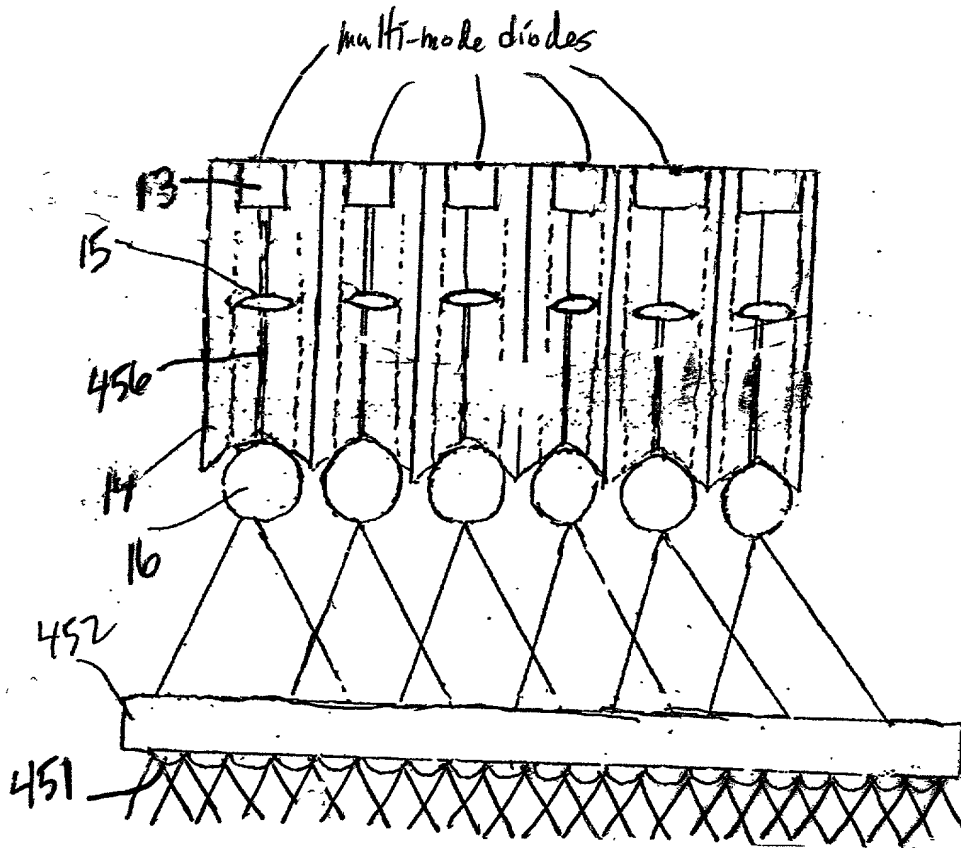


FIG 1I19C

Fifth GENERALIZED METHOD
of Reducing Speckle-Noise
PATTERNS AT IMAGE
DETECTION array OF THE
IFD subsystem (3)

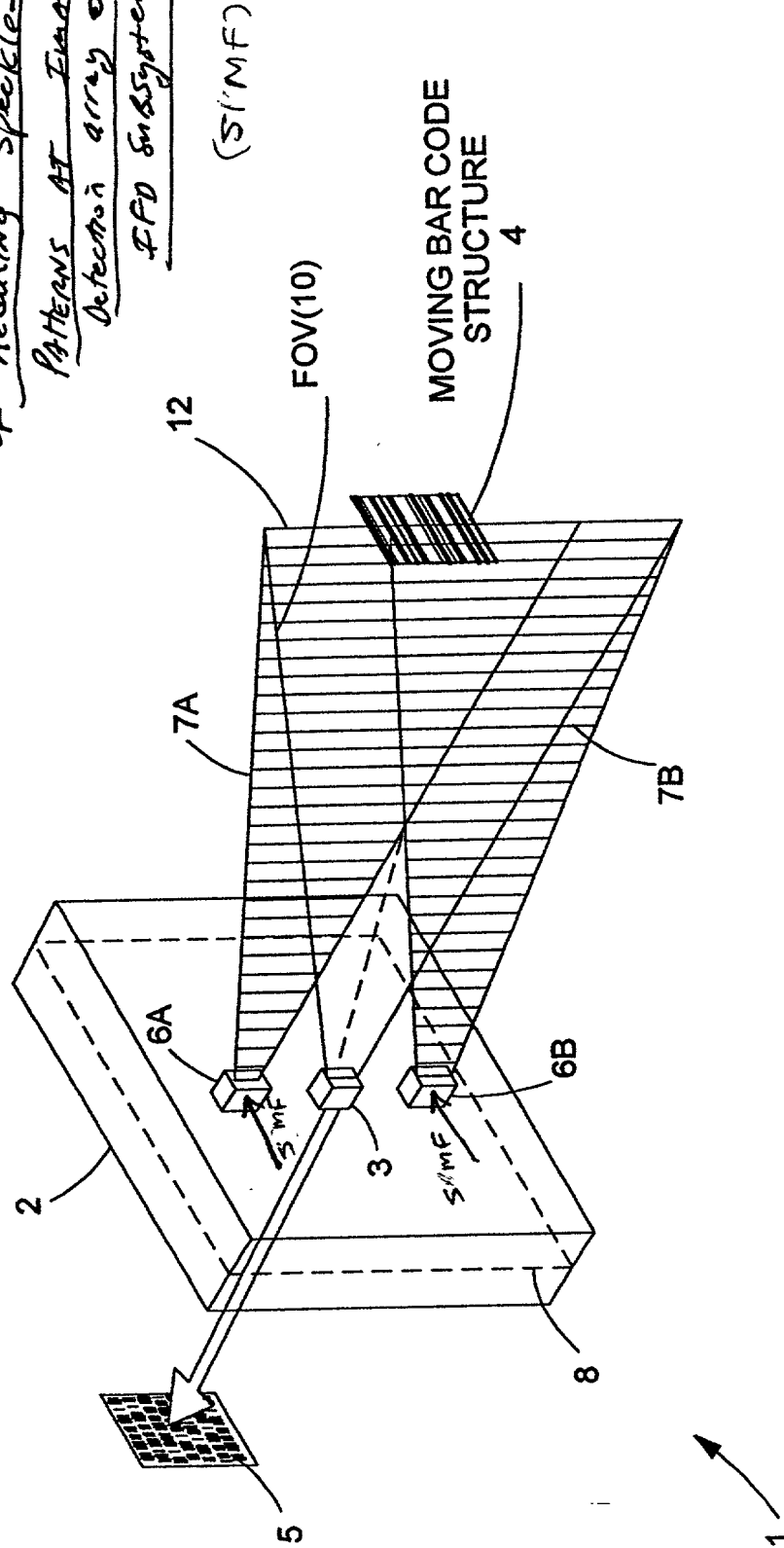


FIG 1F 20

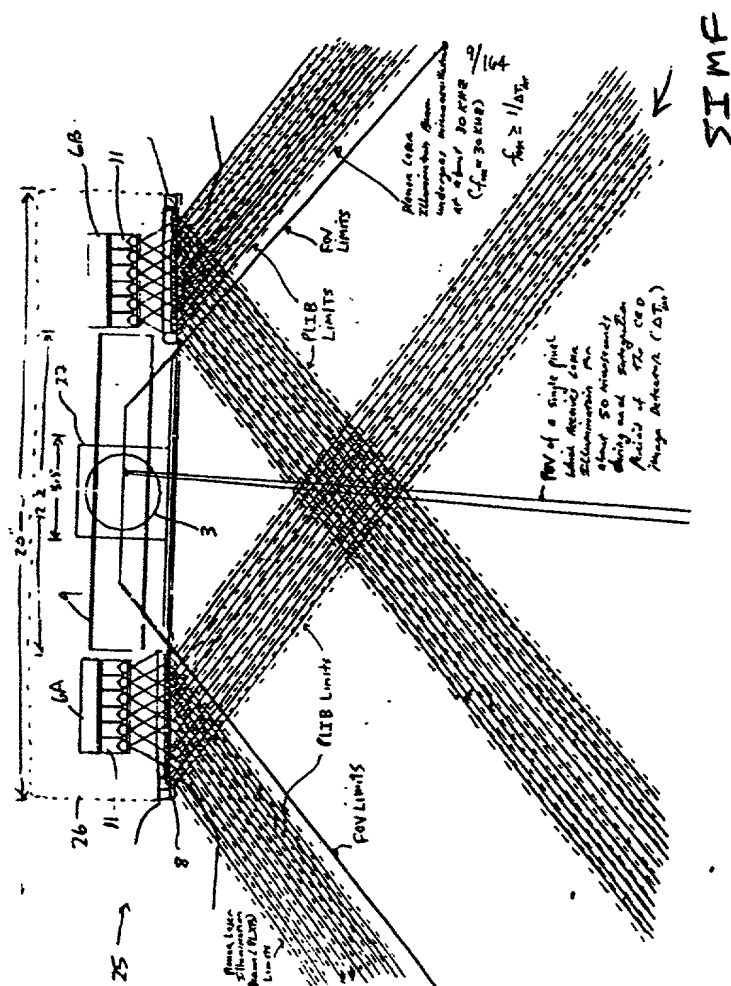


FIG. 1 I ZOA

Precision to object illumination

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Fifth Generalized Speckle-Noise Pattern Reduction Method
Of The Present Invention

Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the spatial intensity of the transmitted PLIB along the planar extent thereof according to a spatial intensity modulation function (SIMF) so as to

produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

↓

Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce power of the speckle-noise pattern observed at the image detection array.

FIG. 1I20B

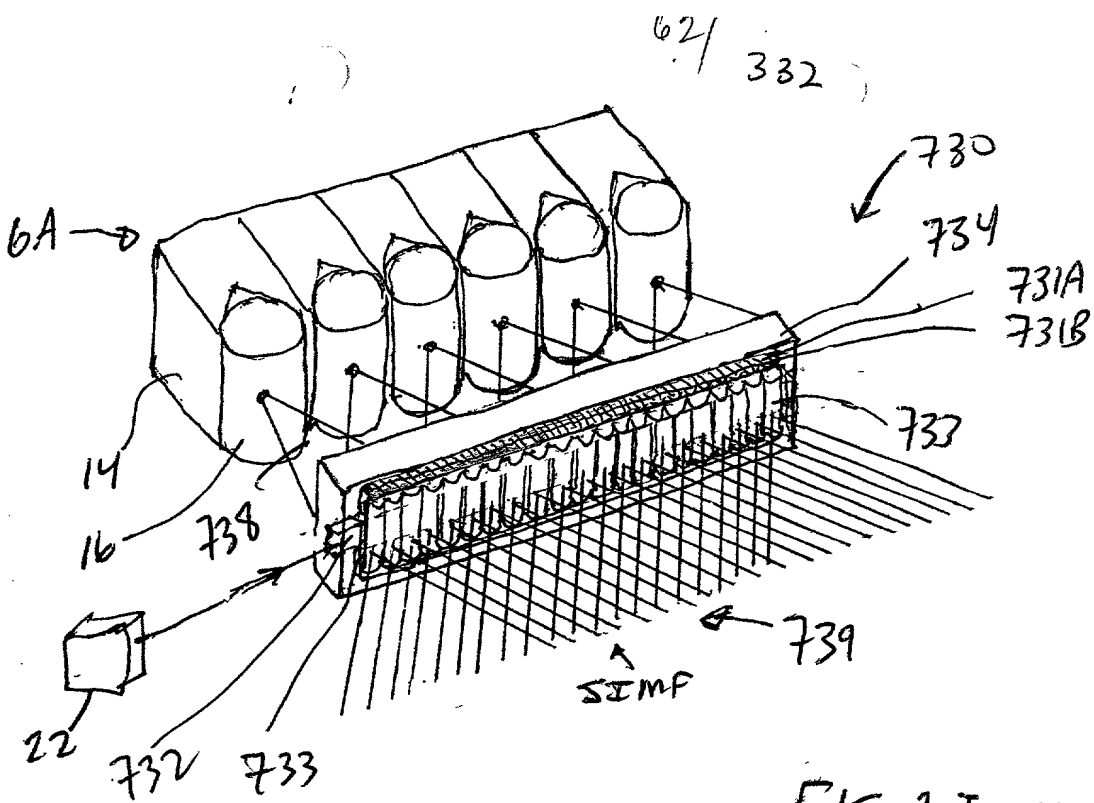


FIG. 1I2IA

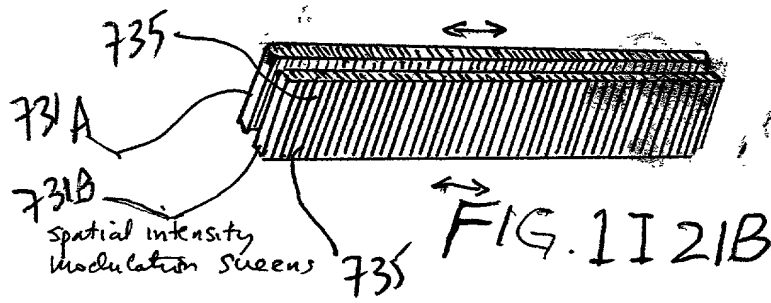


FIG. 1I2IB

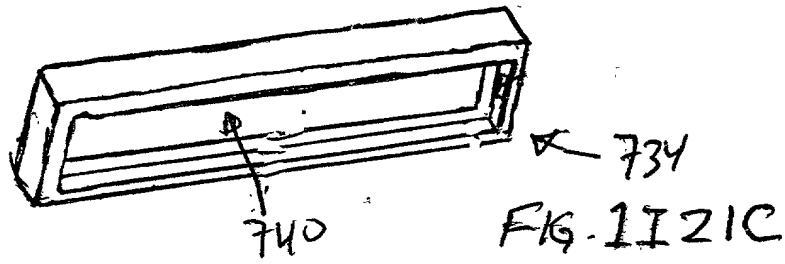


FIG. 1I2IC

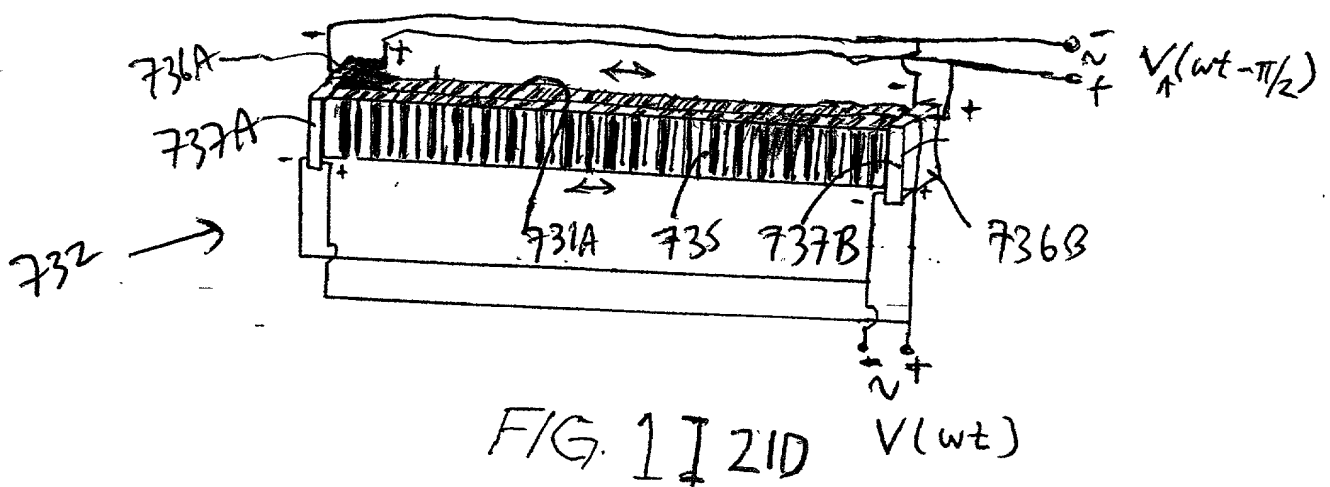


FIG. 1I2ID

Generalized Method of
Reducing Speckle-Noise Patterns
at Image Detection array
of the IFD Subsystem
(SIMF)

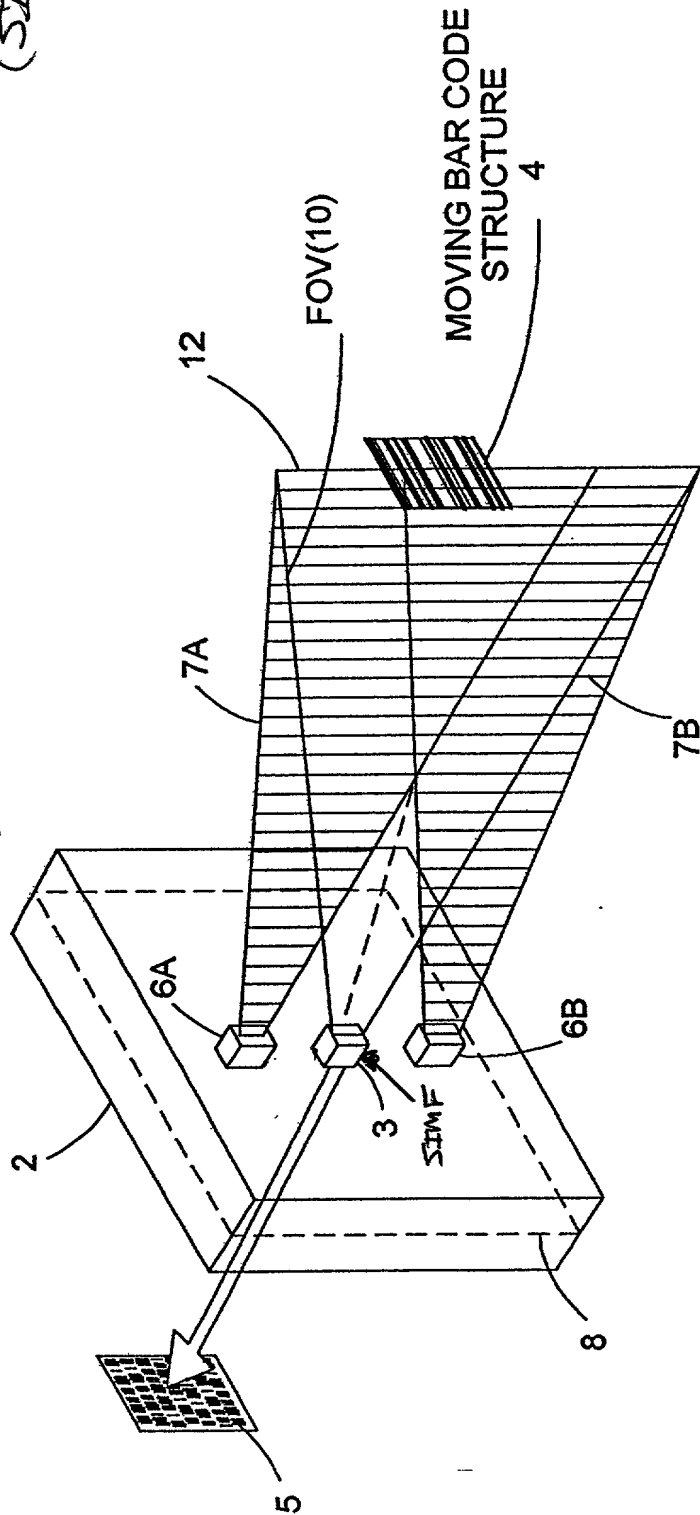


FIG. 1I 22

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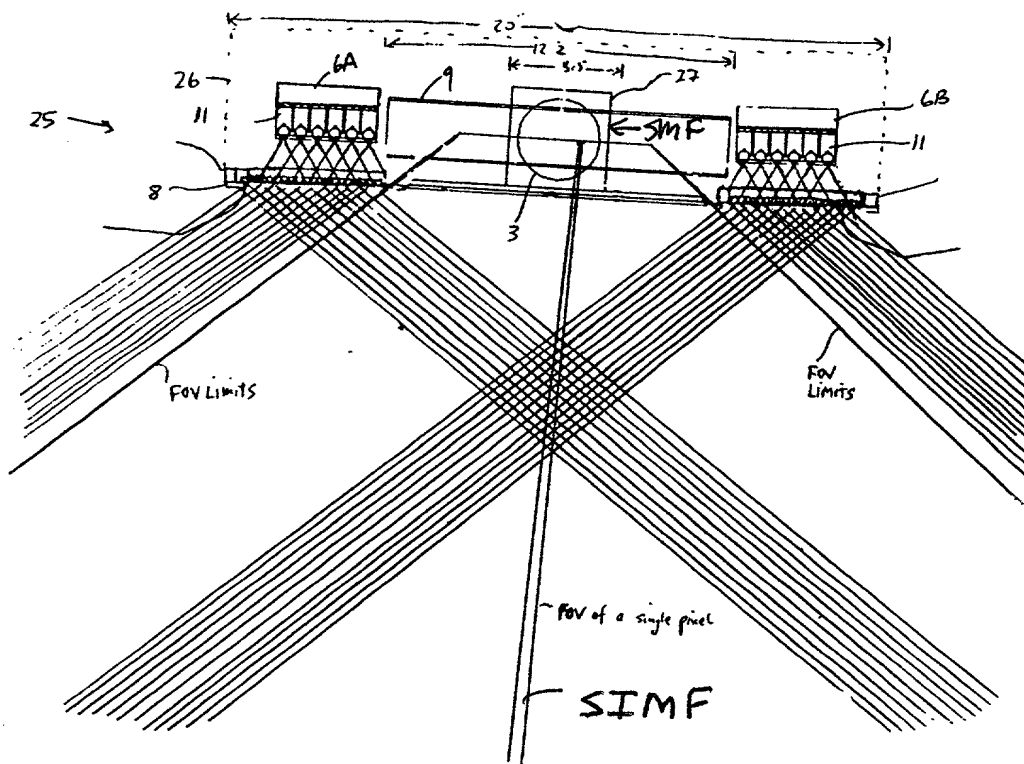


FIG. II 22A

Sixth Generalized Speckle-Noise Pattern Reduction Method
Of The Present Invention

After illumination of the target with the planar laser illumination beam (PLIB), modulate the spatial intensity of the reflected/scattered (i.e. received) PLIB along the planar extent thereof according to a spatial intensity modulation function (SIMF) so as to .

produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the many substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce the speckle-noise pattern observed at the image detection array.

FIG. 1I 22B

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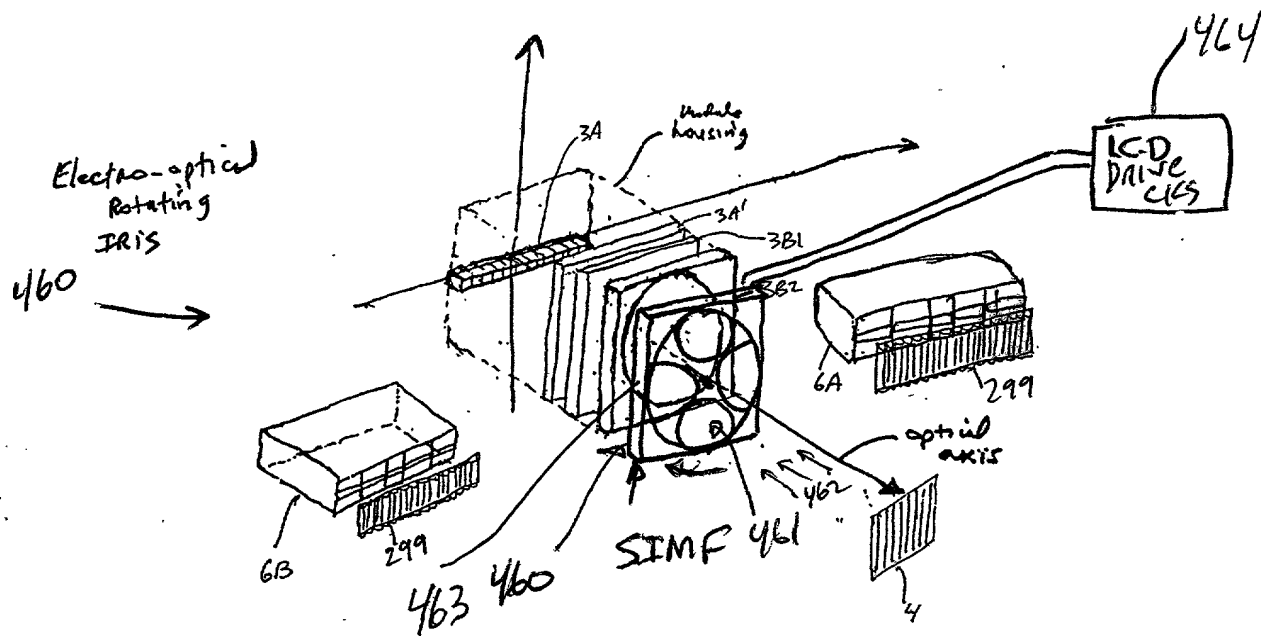


FIG. 1I 23A

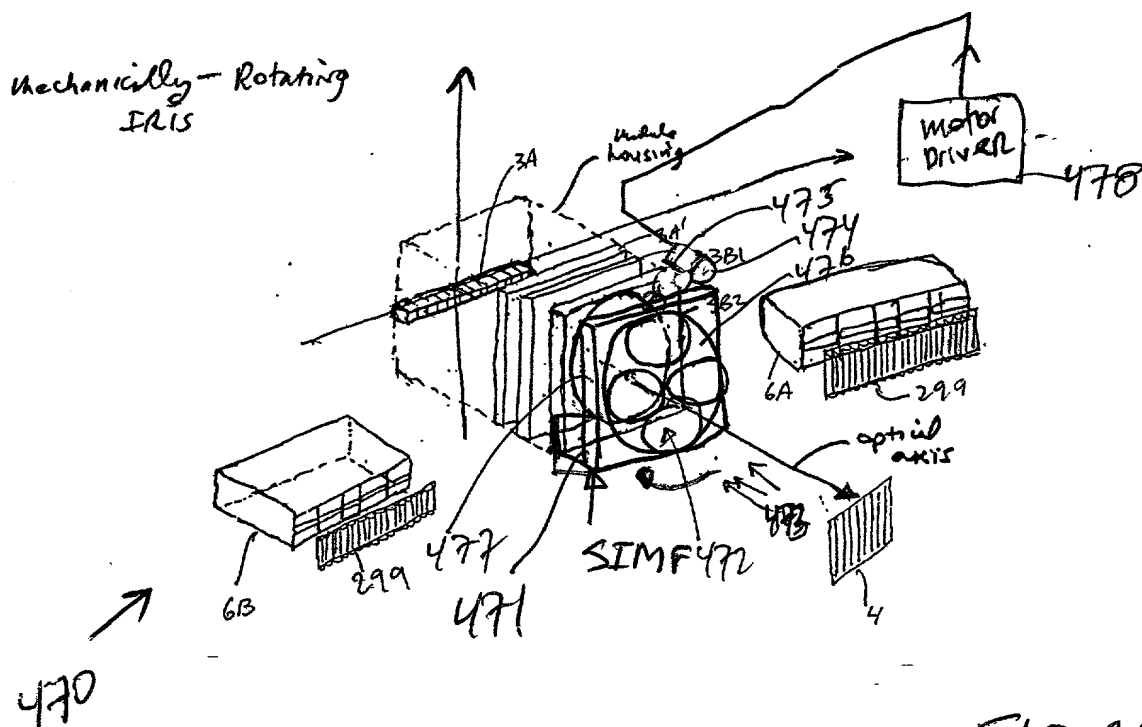


FIG. 1I 23B

Seventh Generalized Method of
Reducing Specle - Noise Patterns
at Image Detection Array
of IR FPD Subsystem

(TIME)

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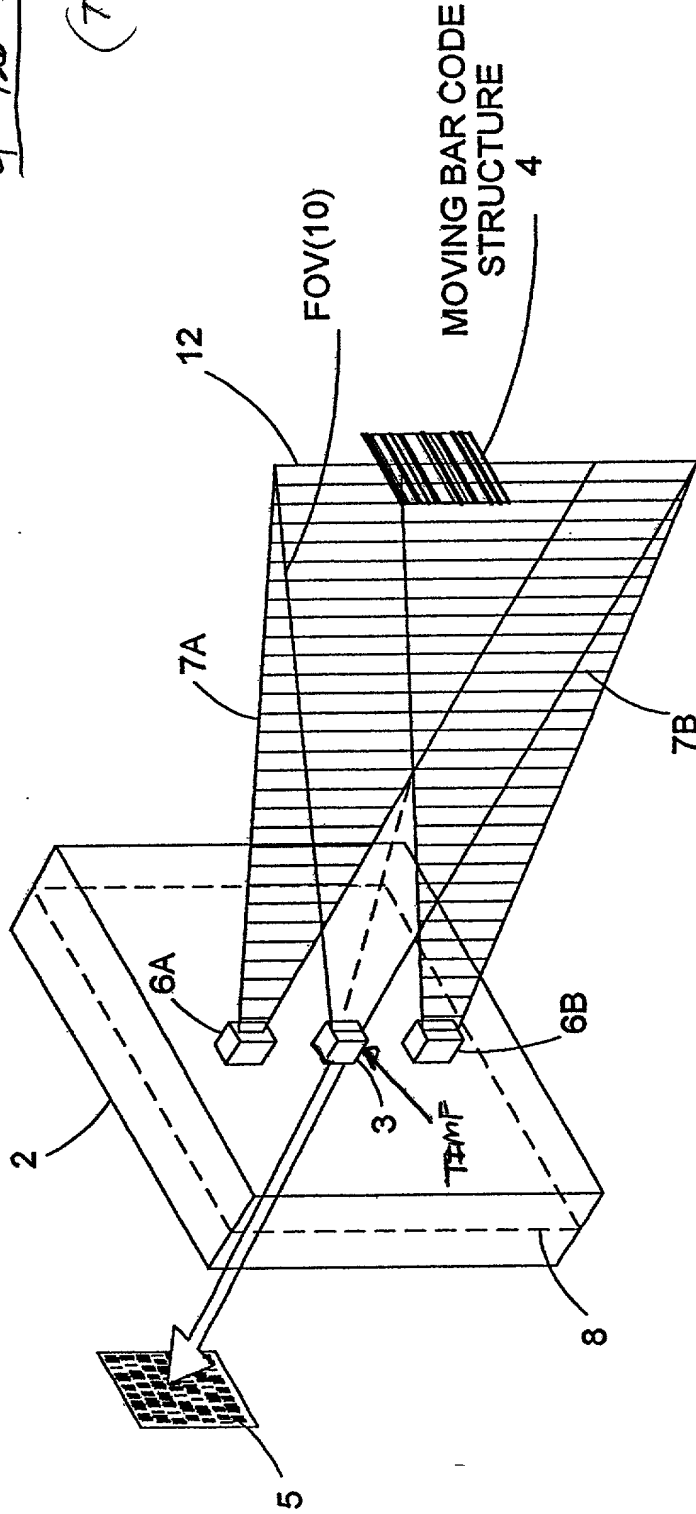


FIG. 1124

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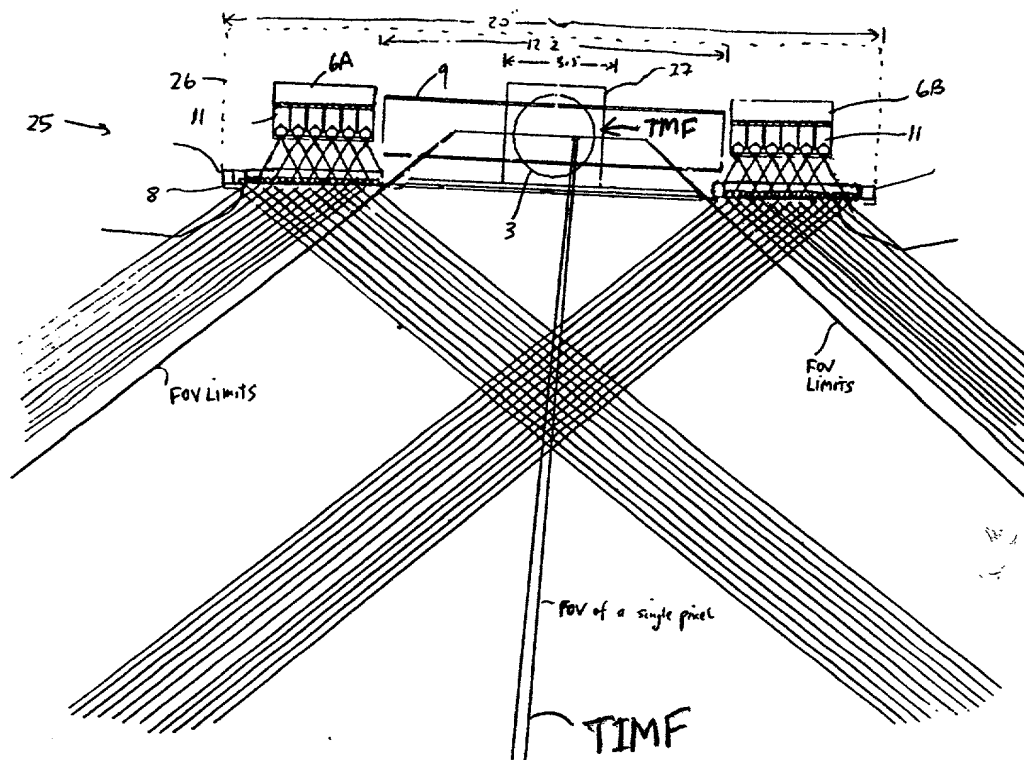


FIG. 1I24A

Seventh Generalized Speckle-Noise Pattern Reduction Method
Of The Present Invention

After illumination of the target with the planar laser illumination beam (PLIB), modulate the temporal intensity of the reflected/scattered (i.e. received) PLIB along the planar extent thereof according to a temporal intensity modulation function (TIMF) so as to

produce many substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the many substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce the speckle-noise pattern observed at the image detection array.

FIG. 1I24B

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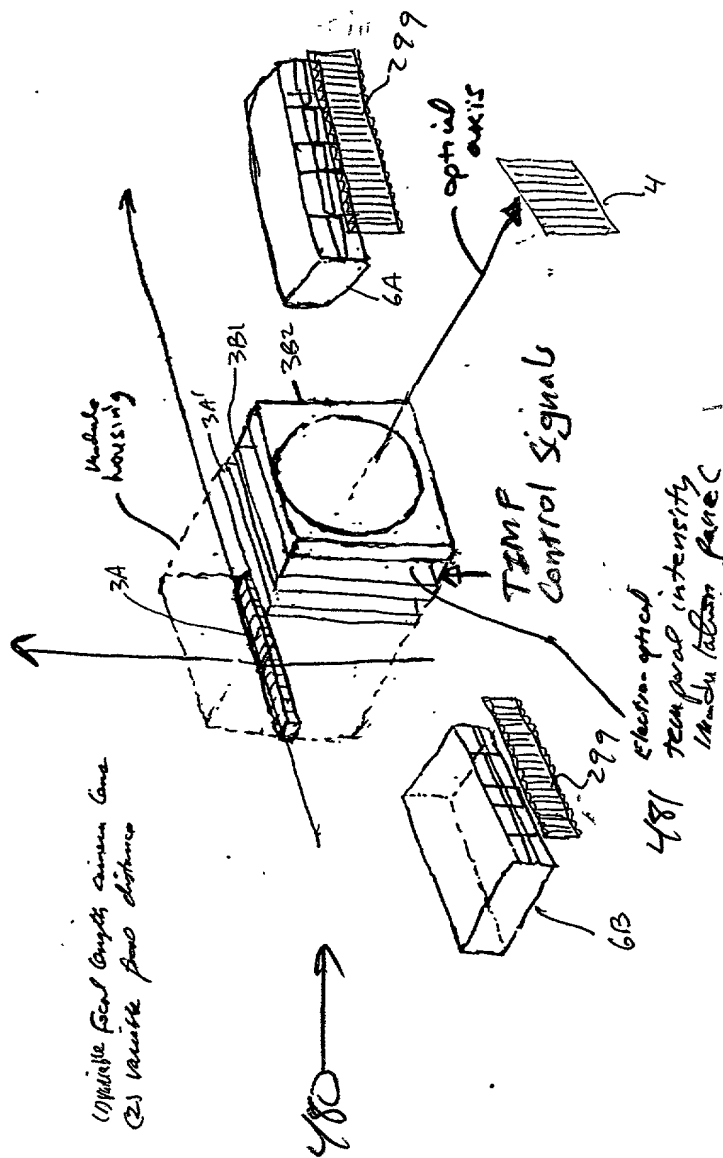
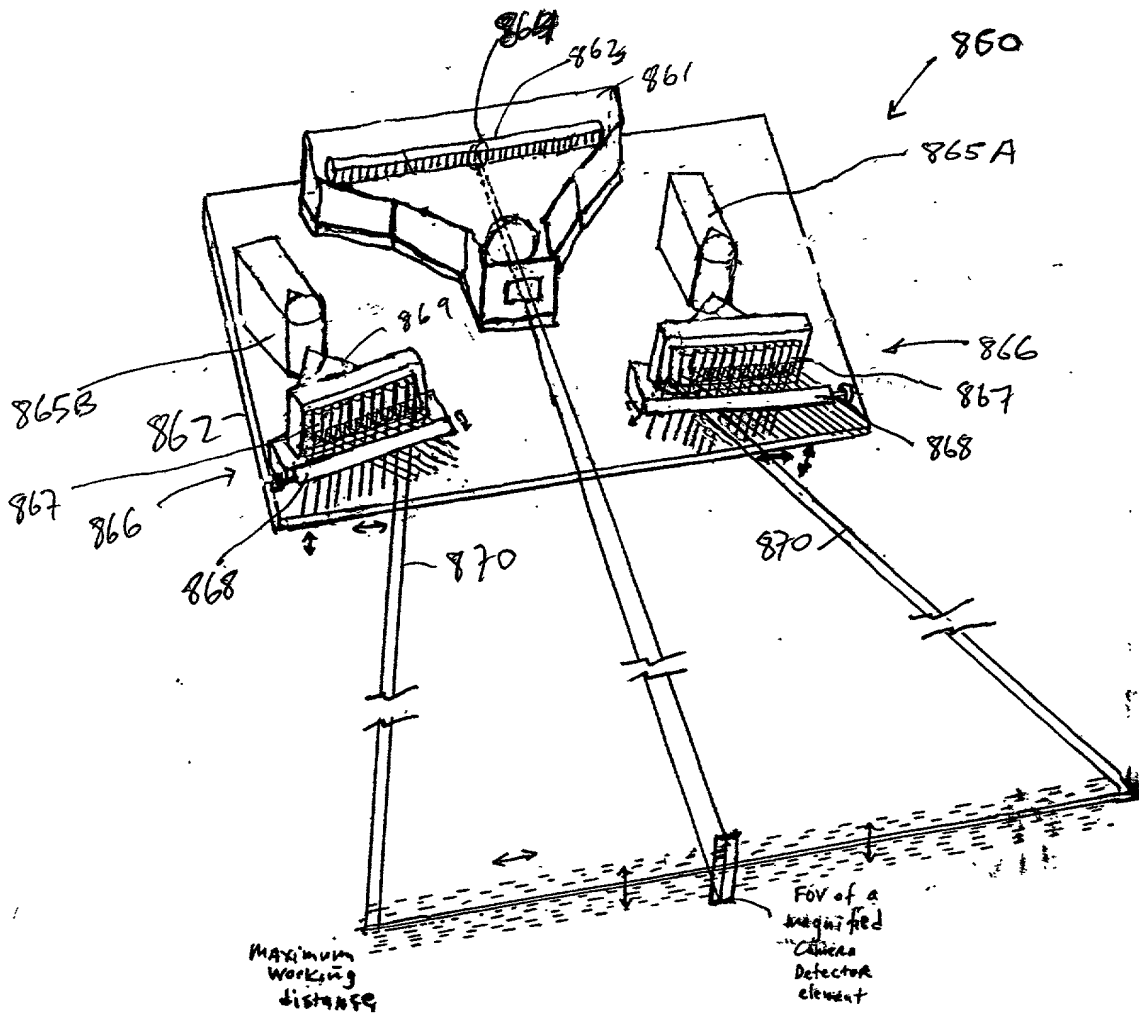


FIG. 11 Z4C

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* Lateral and Transverse Microoscillation of PLIB

FIG. 1I25A1

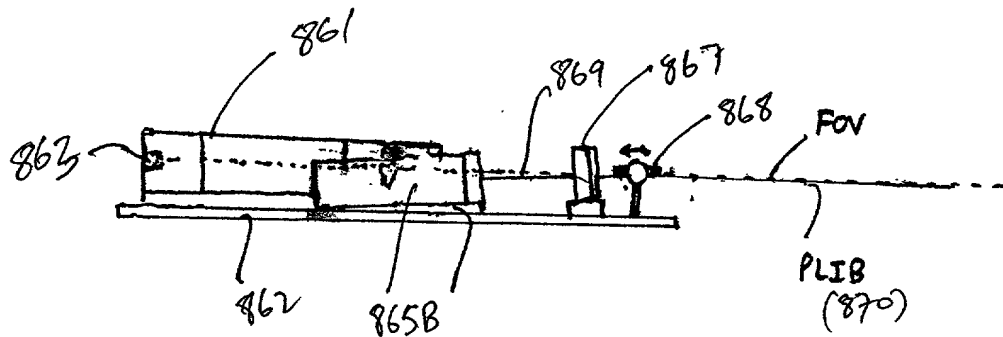


FIG. 1I25A2

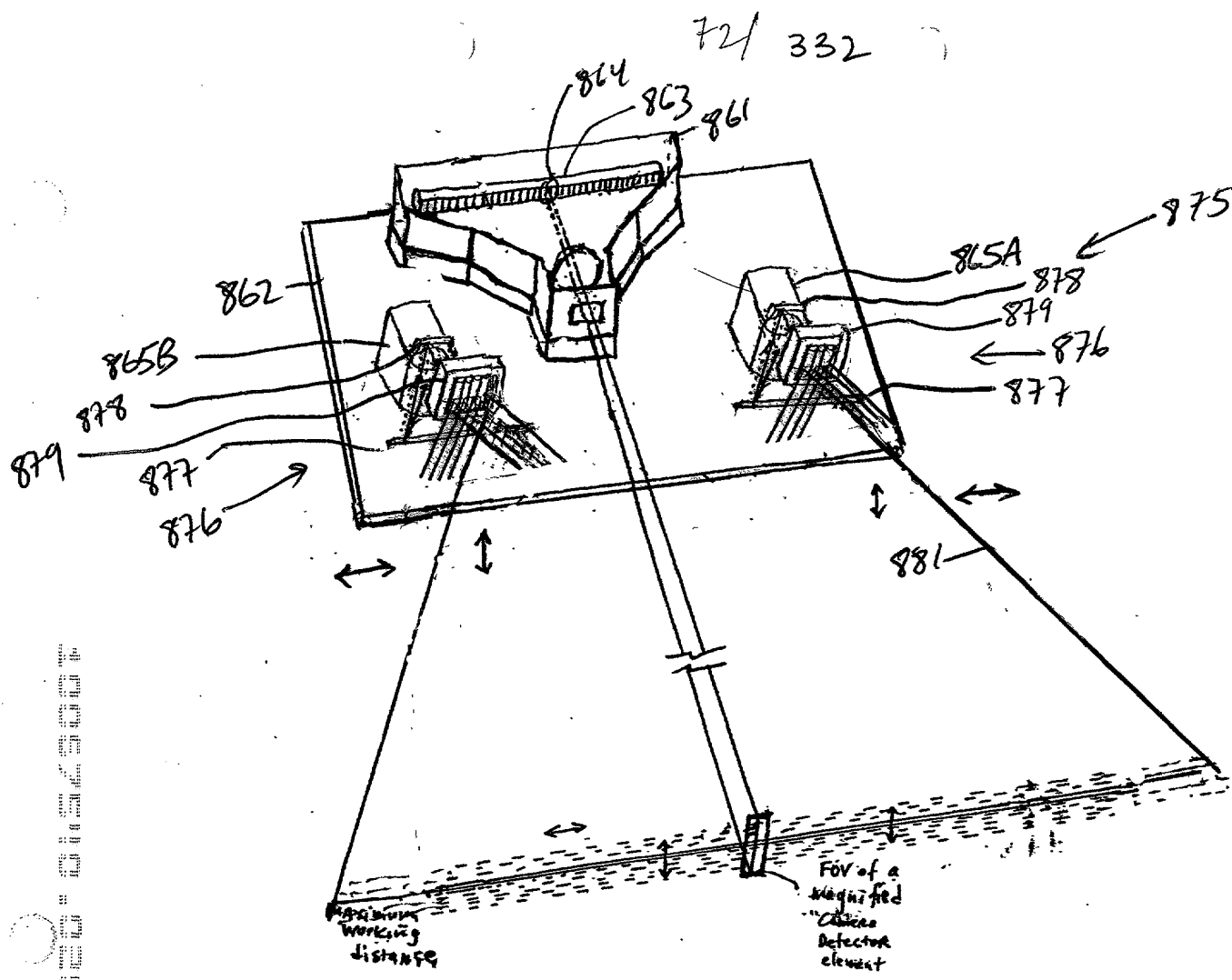


FIG. 1 I 25 B 1

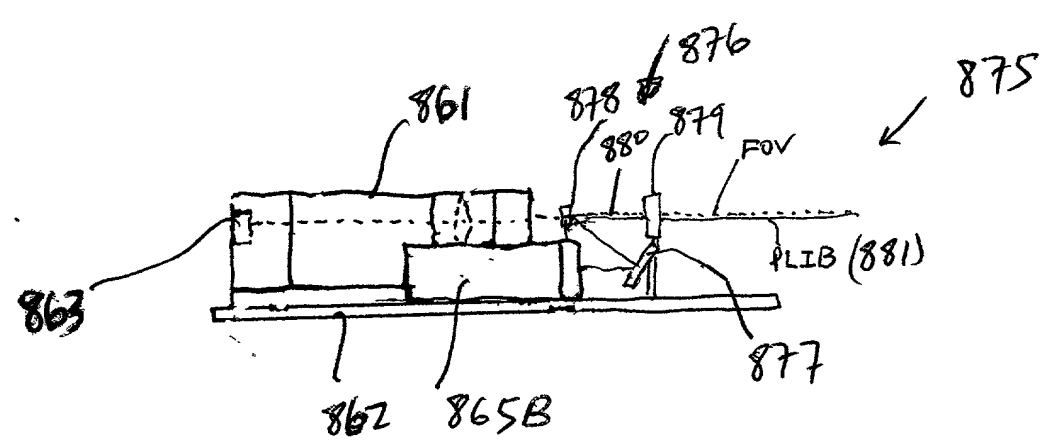
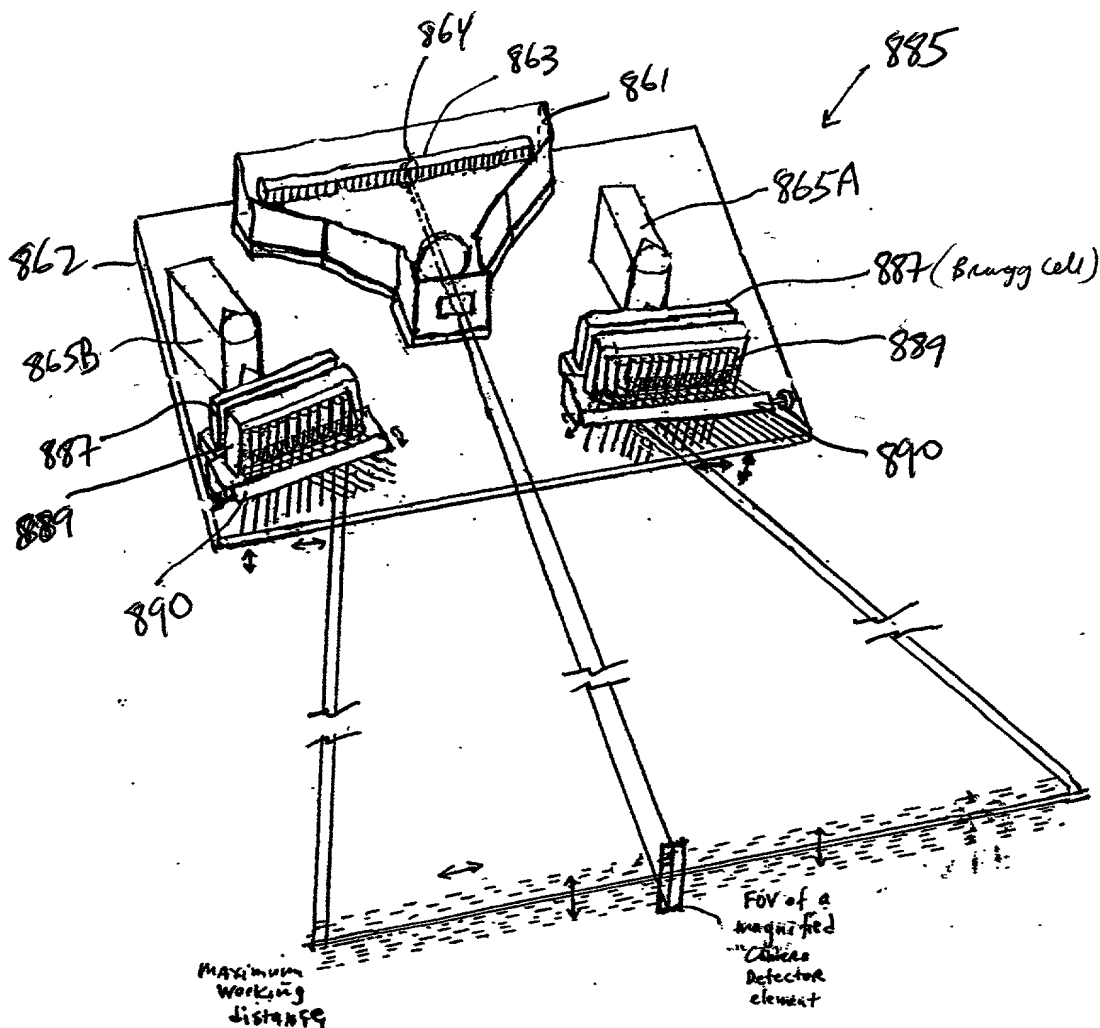


FIG. 1 I 25 B 2



* Lateral and Transverse Maxioscillation of PLIB

FIG. 1I25C1

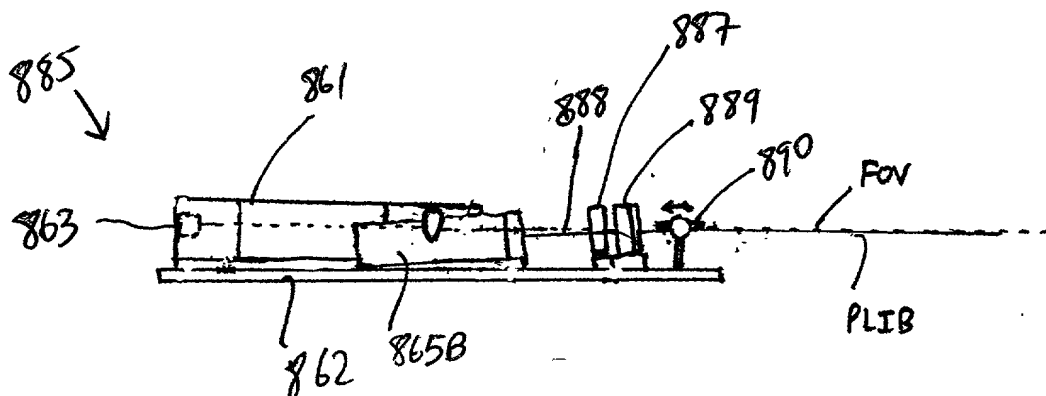
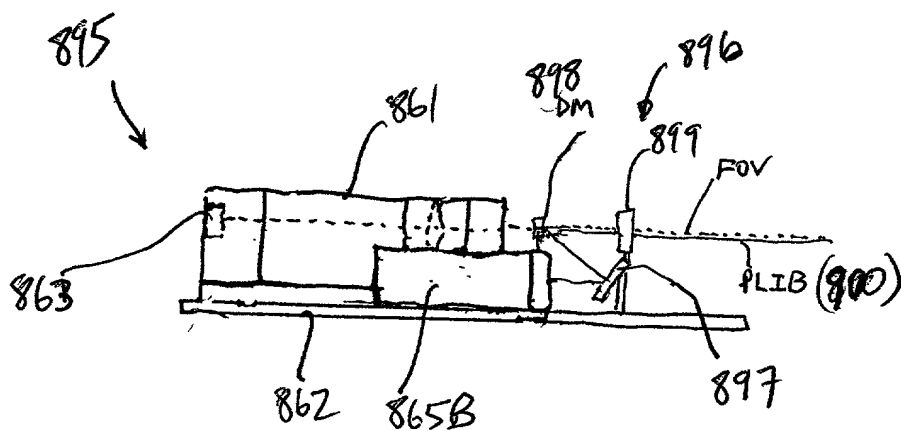
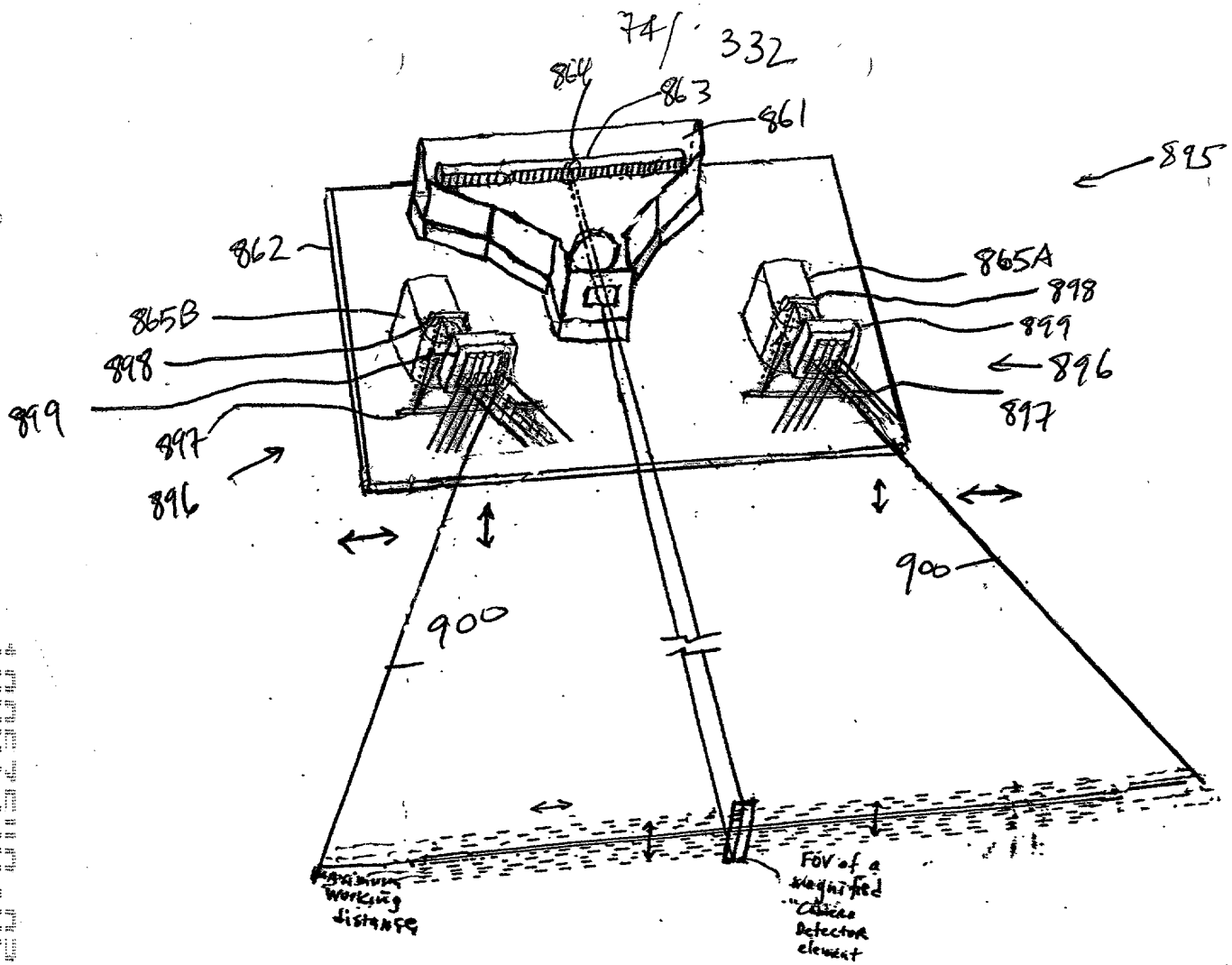
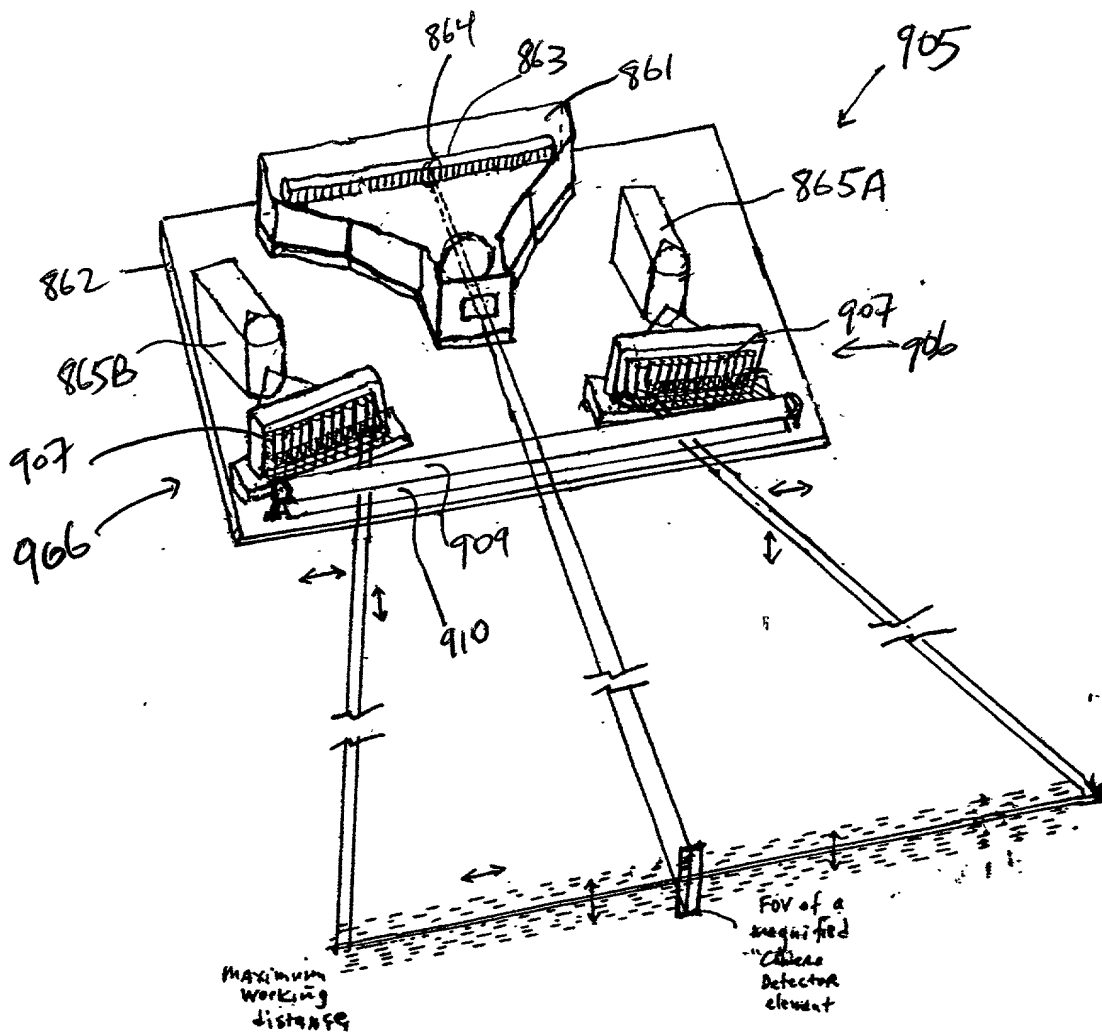


FIG. 1I25C2





* Lateral and Transverse Microoscillation of PLIB

905

FIG. 1I25E1

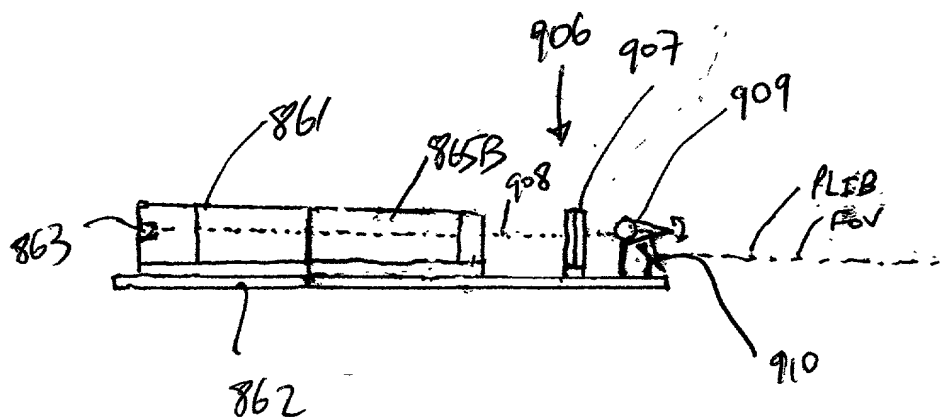


FIG. 1I25E2

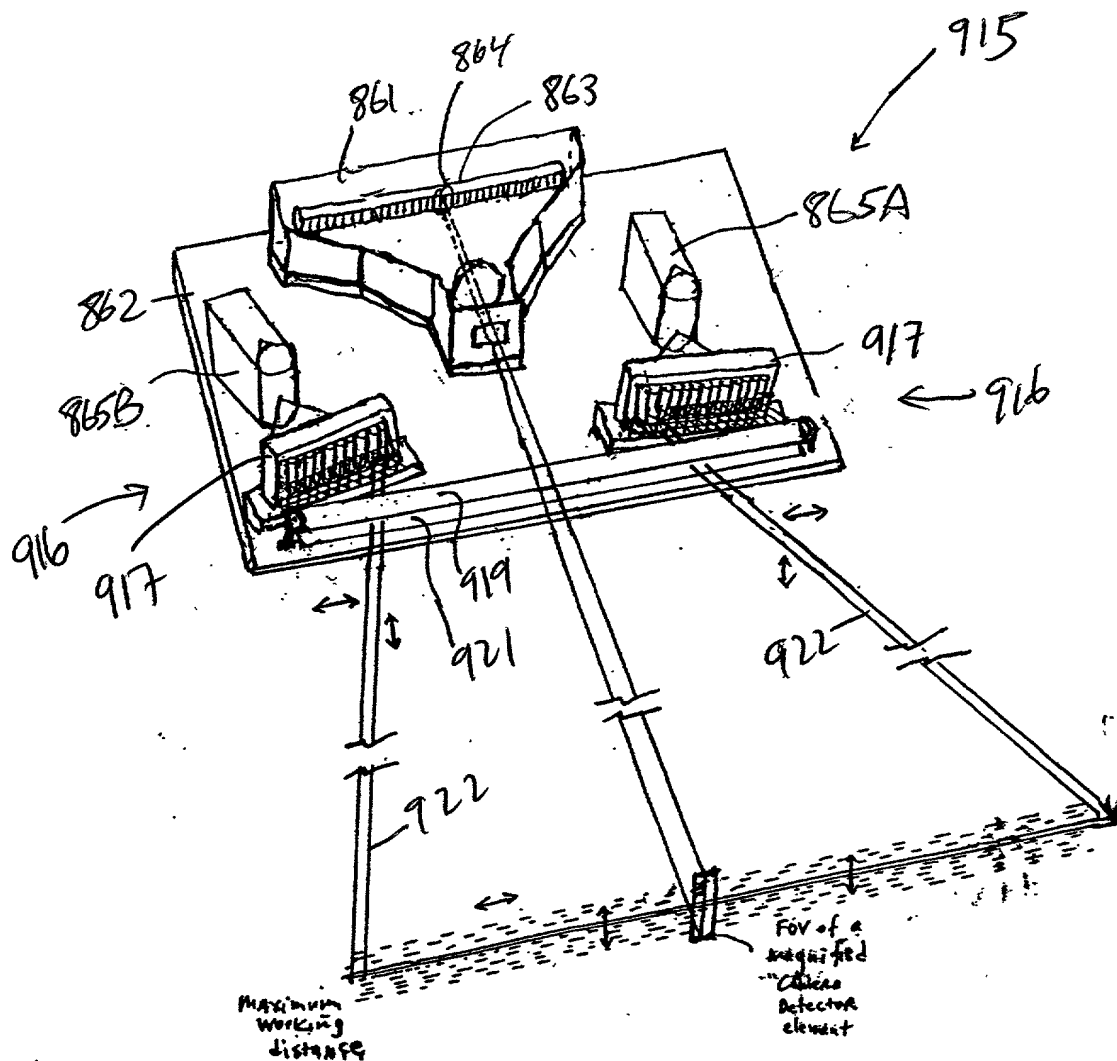


FIG. 1I25F1

* Lateral and Transverse Microoscillation of PLIB

915

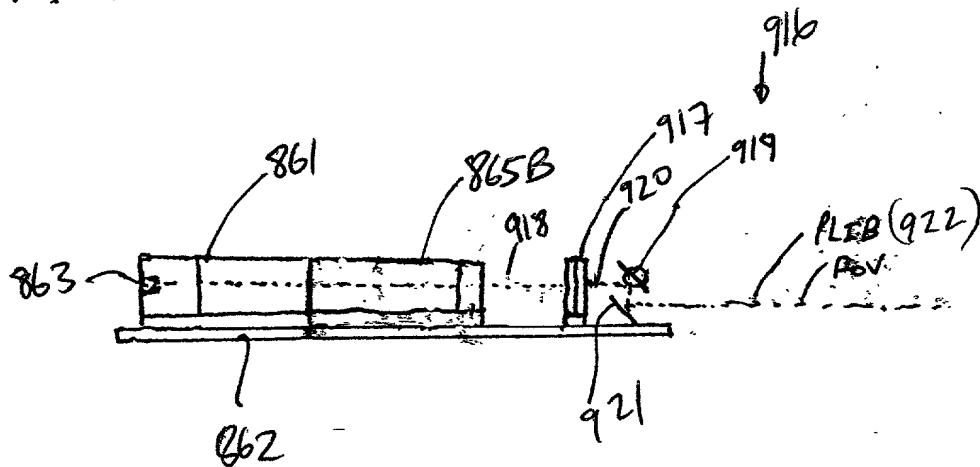


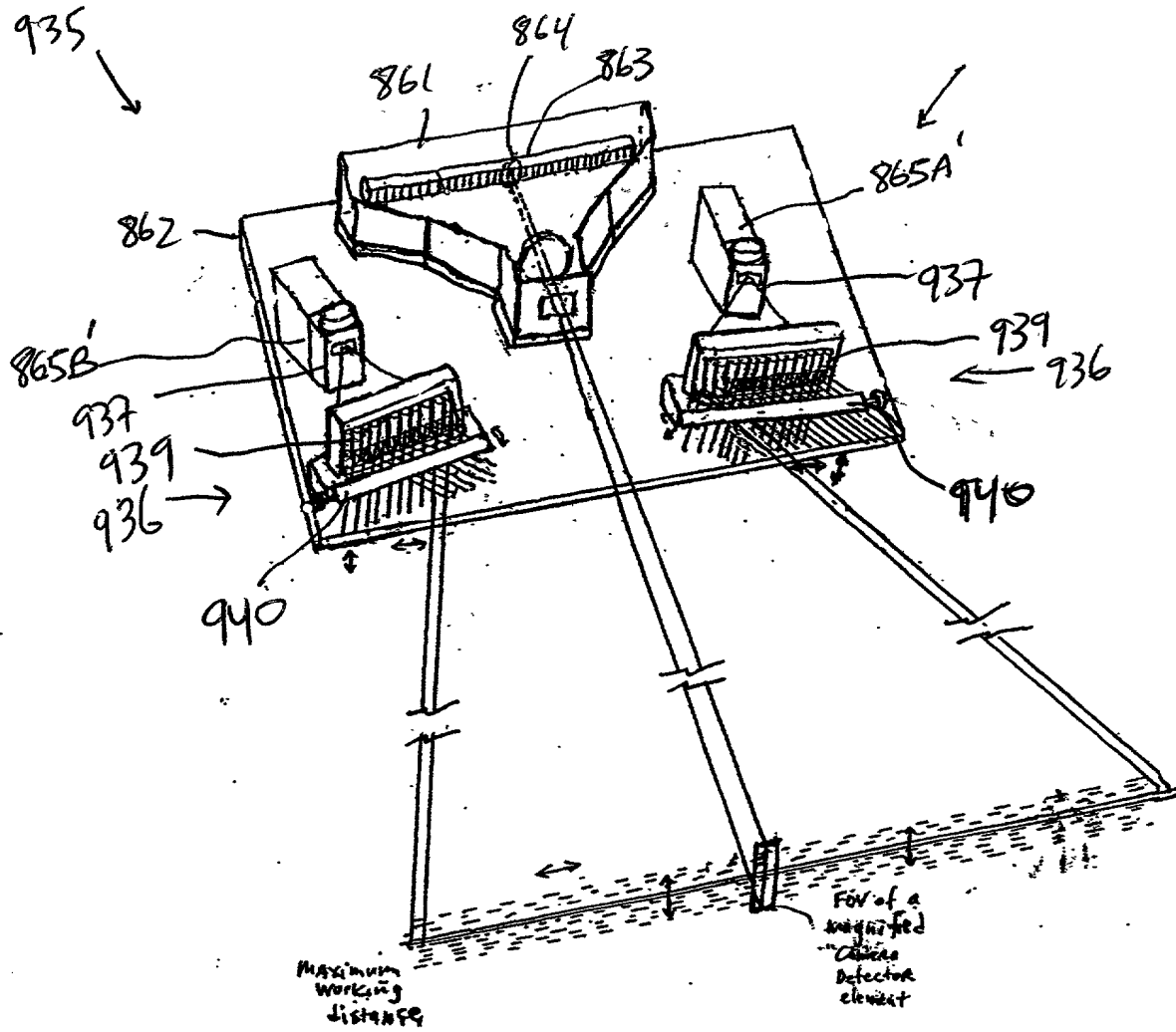
FIG. 1I25F2



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FIG. 1I25G2

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* Lateral and Transverse Microoscillation of PLIB

FIG. 1I25H1

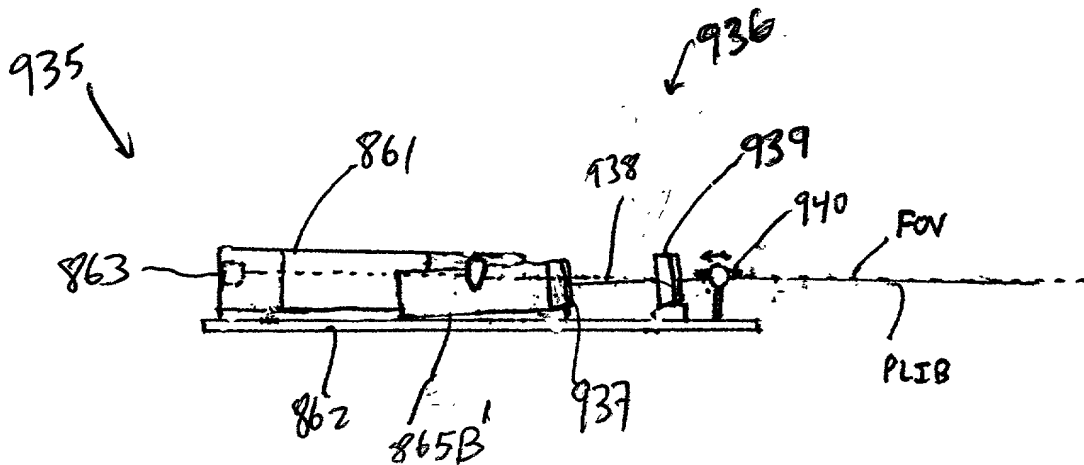
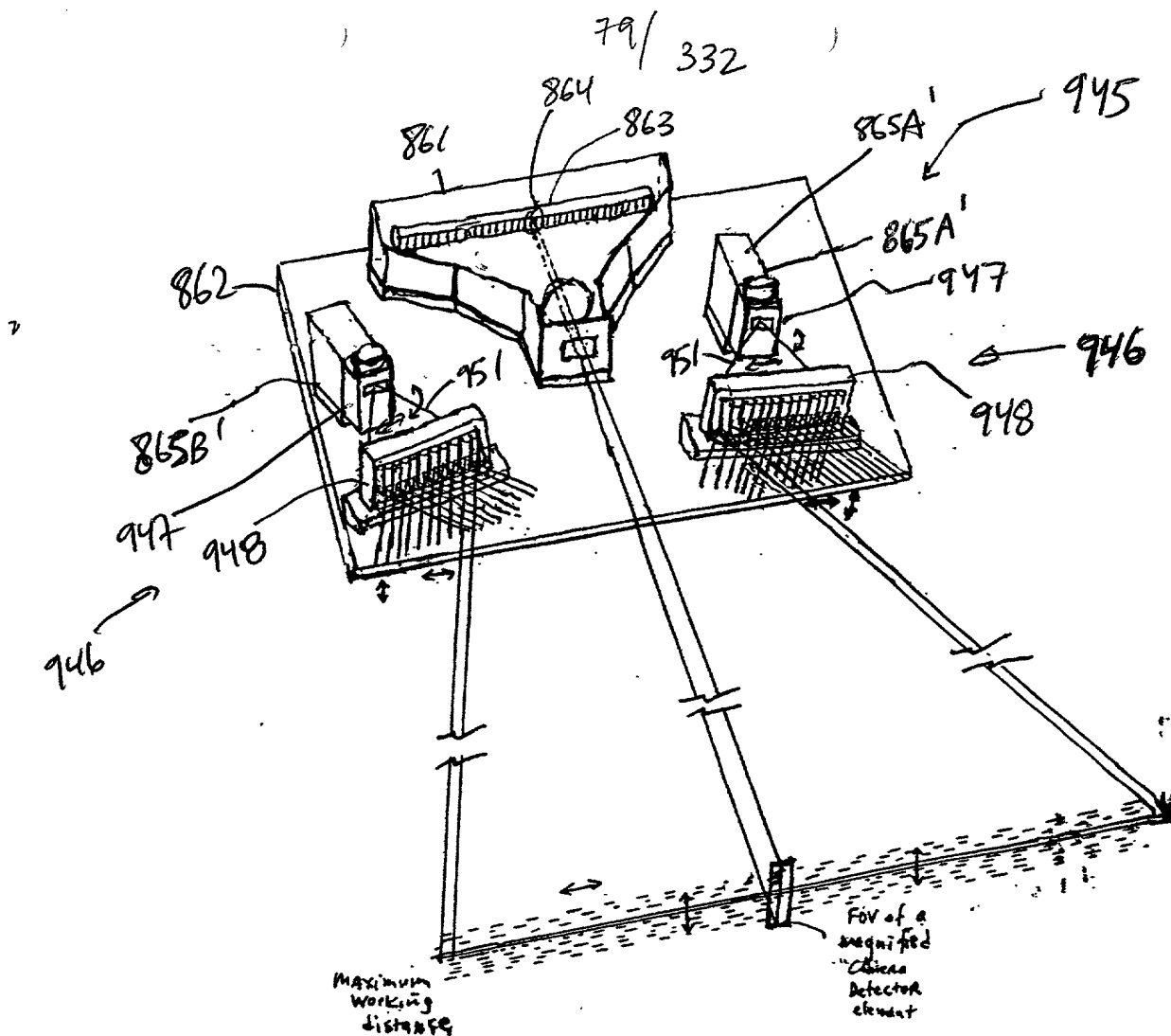
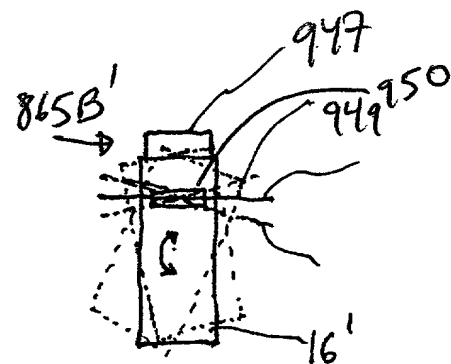
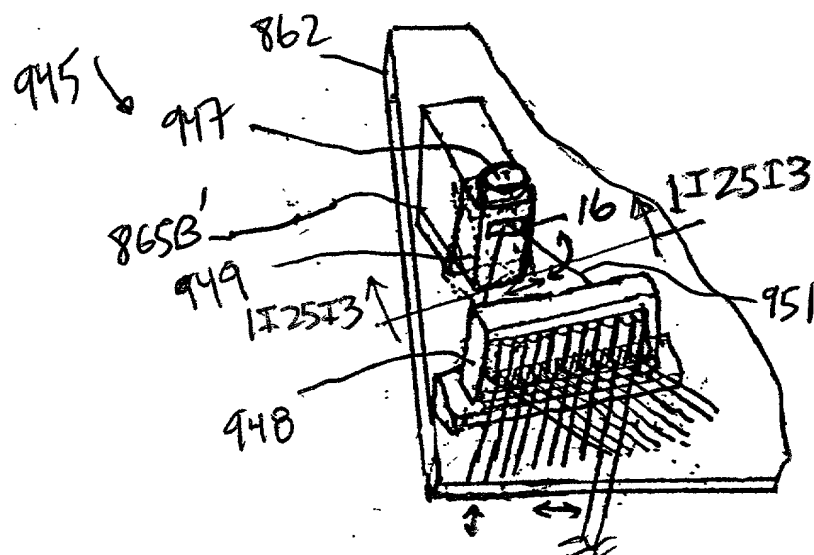


FIG. 1I25H2



Lateral and
Transverse
Excitation of PLIB



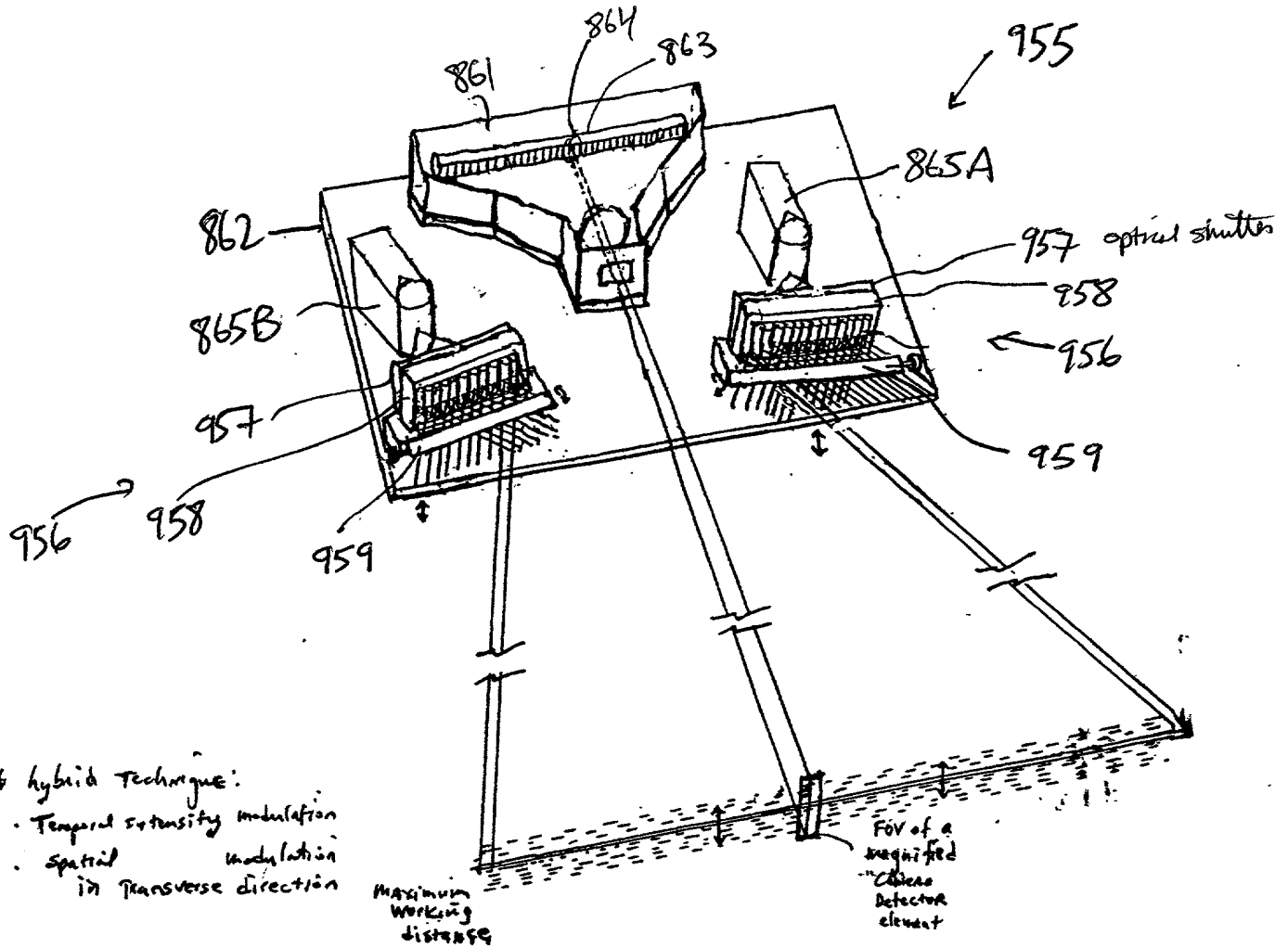


FIG. 1I25J1

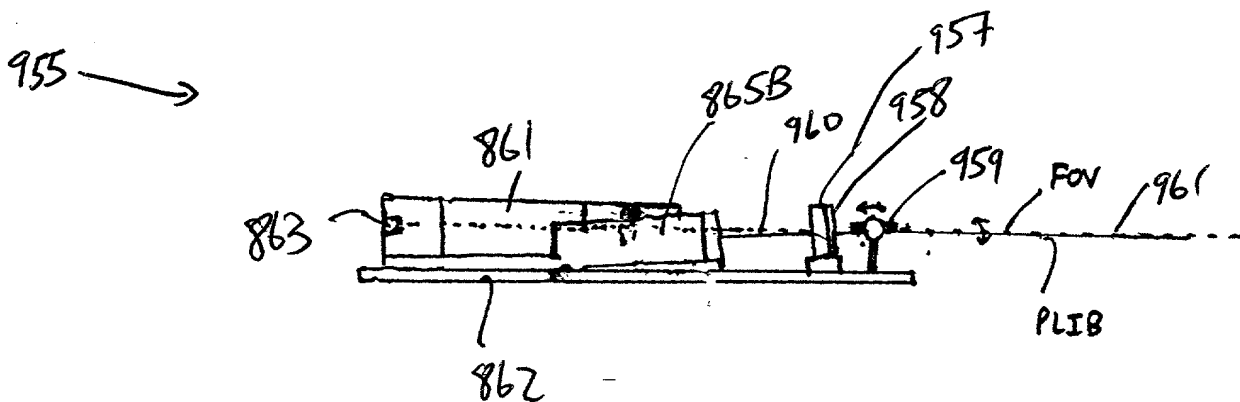


FIG. 1I25J2

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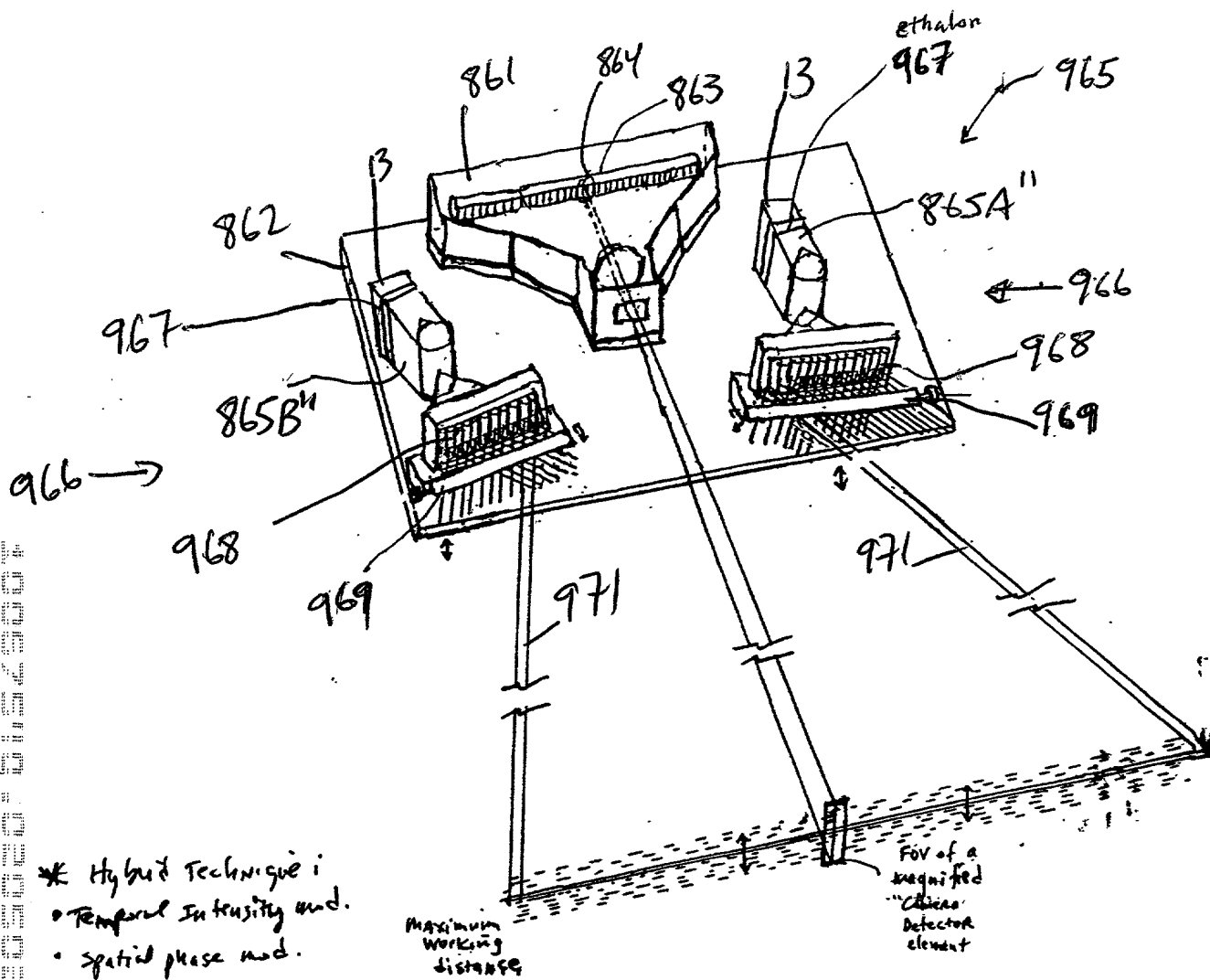


FIG. 1I25K1

Transverse
 Modulation of PLIB

965

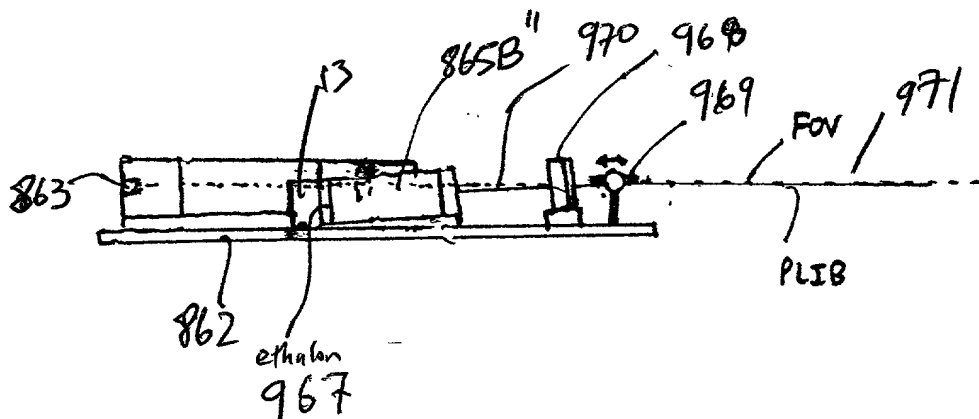
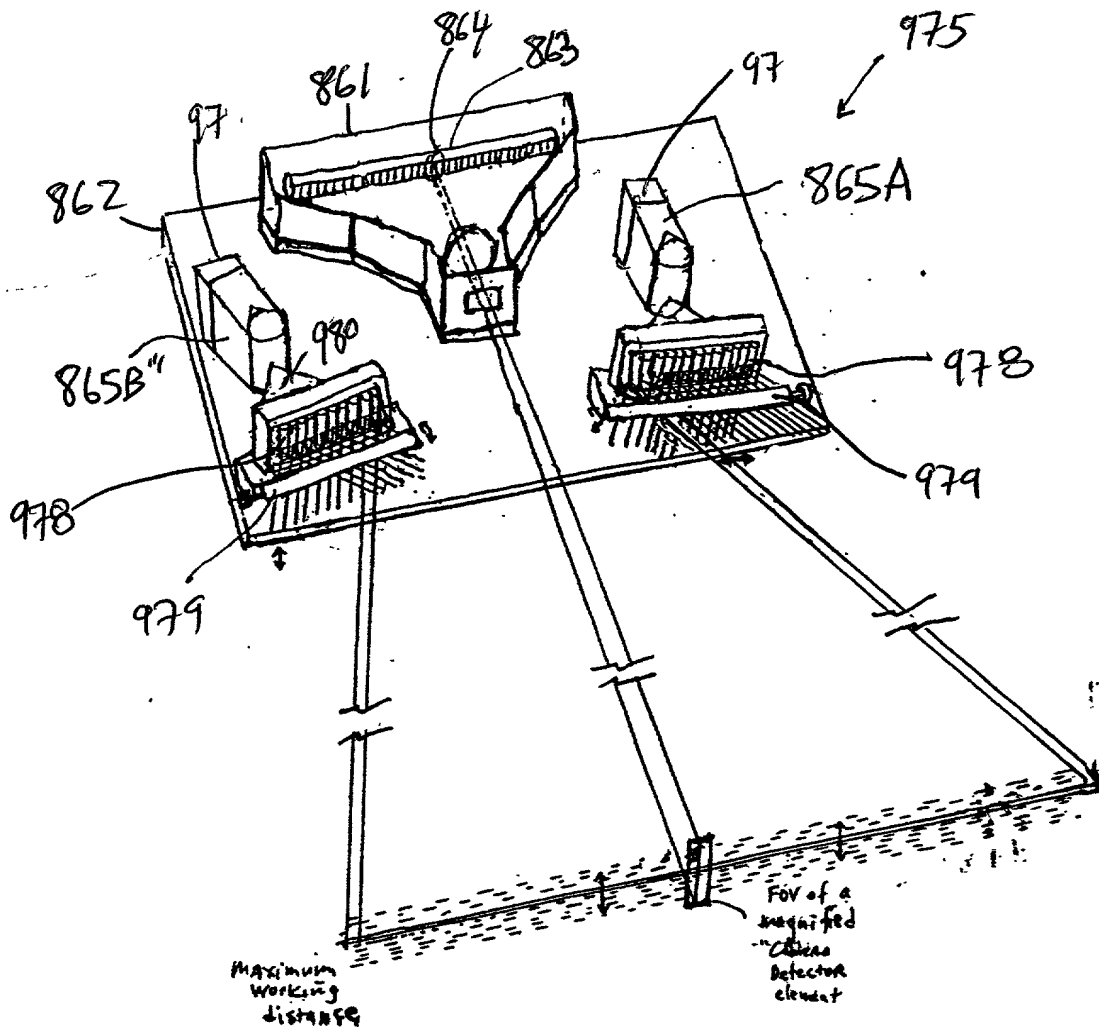


FIG. 1I25K2



* hybrid =
 • Temp. freq. mod.
 • spatial phase mod.

* Transverse
 Microoscillation of PLIB

FIG. 1I25L1

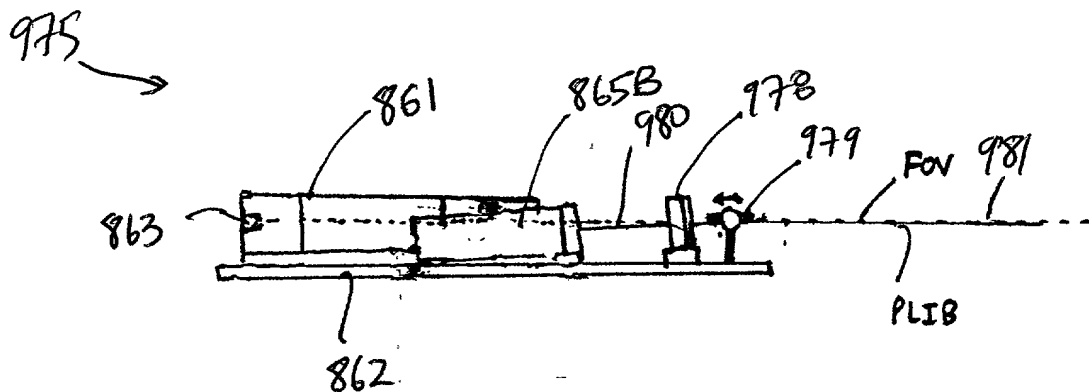
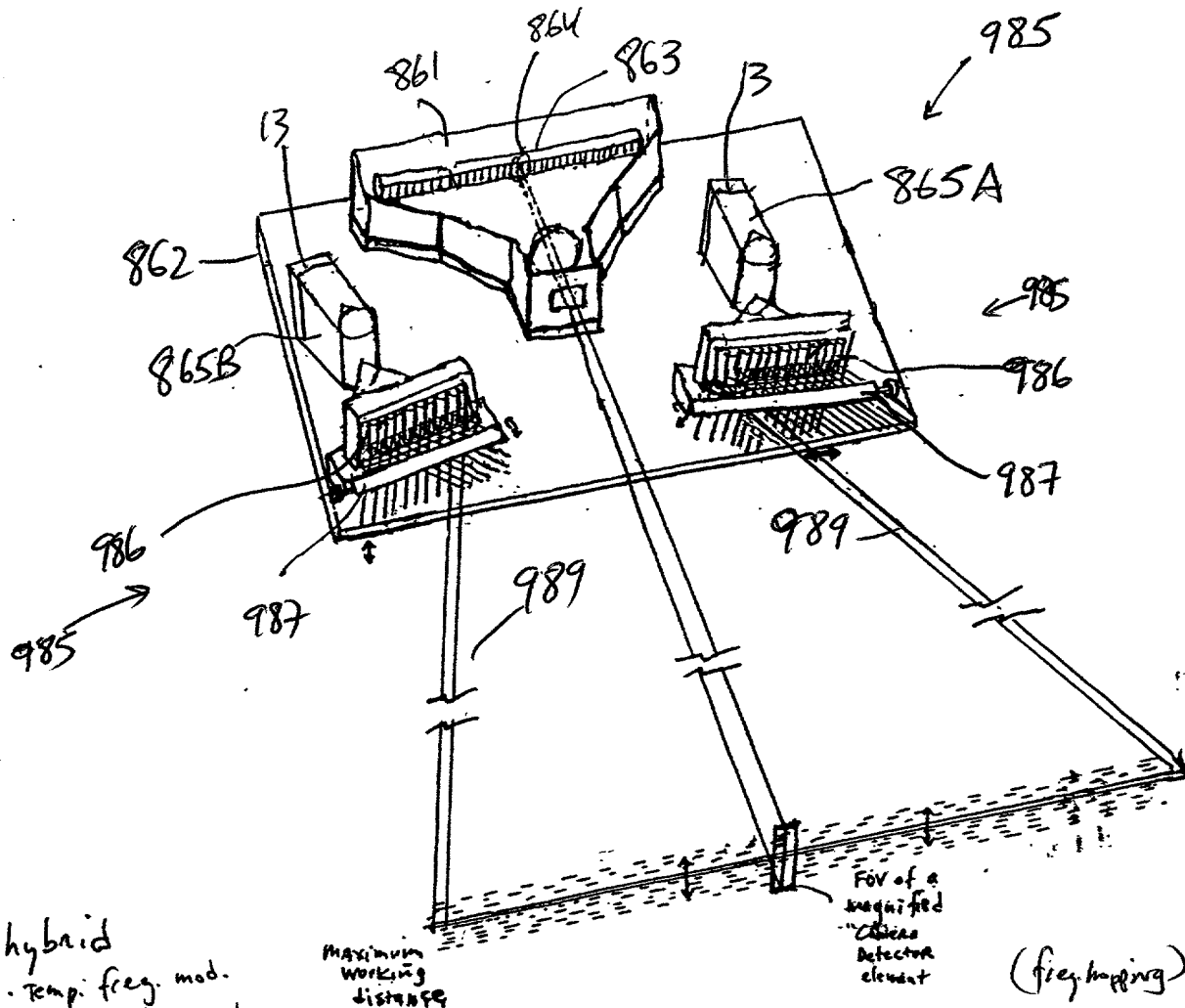


FIG. 1I25L2

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* hybrid
 • Temp. freq. mod.
 • Spatial phase mod.

FIG. 1I25M1

* Transverse
 Microoscillation of PLIB

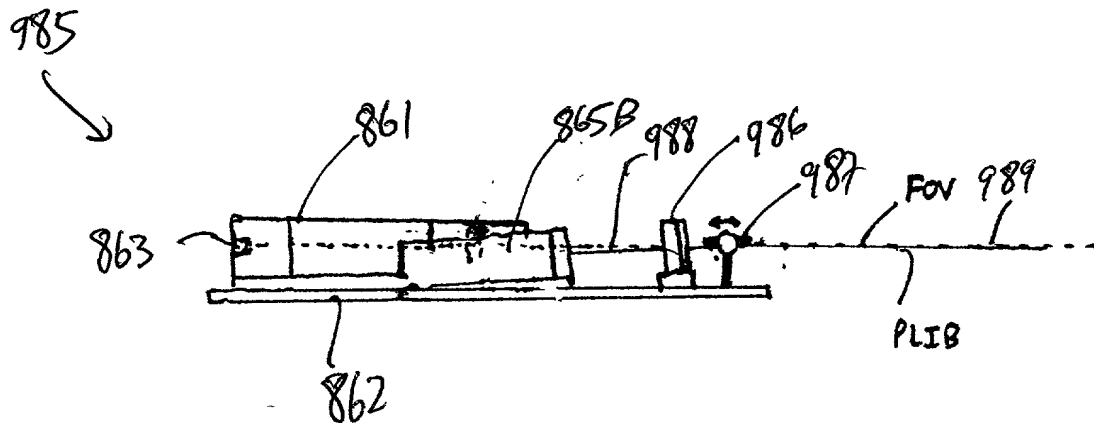
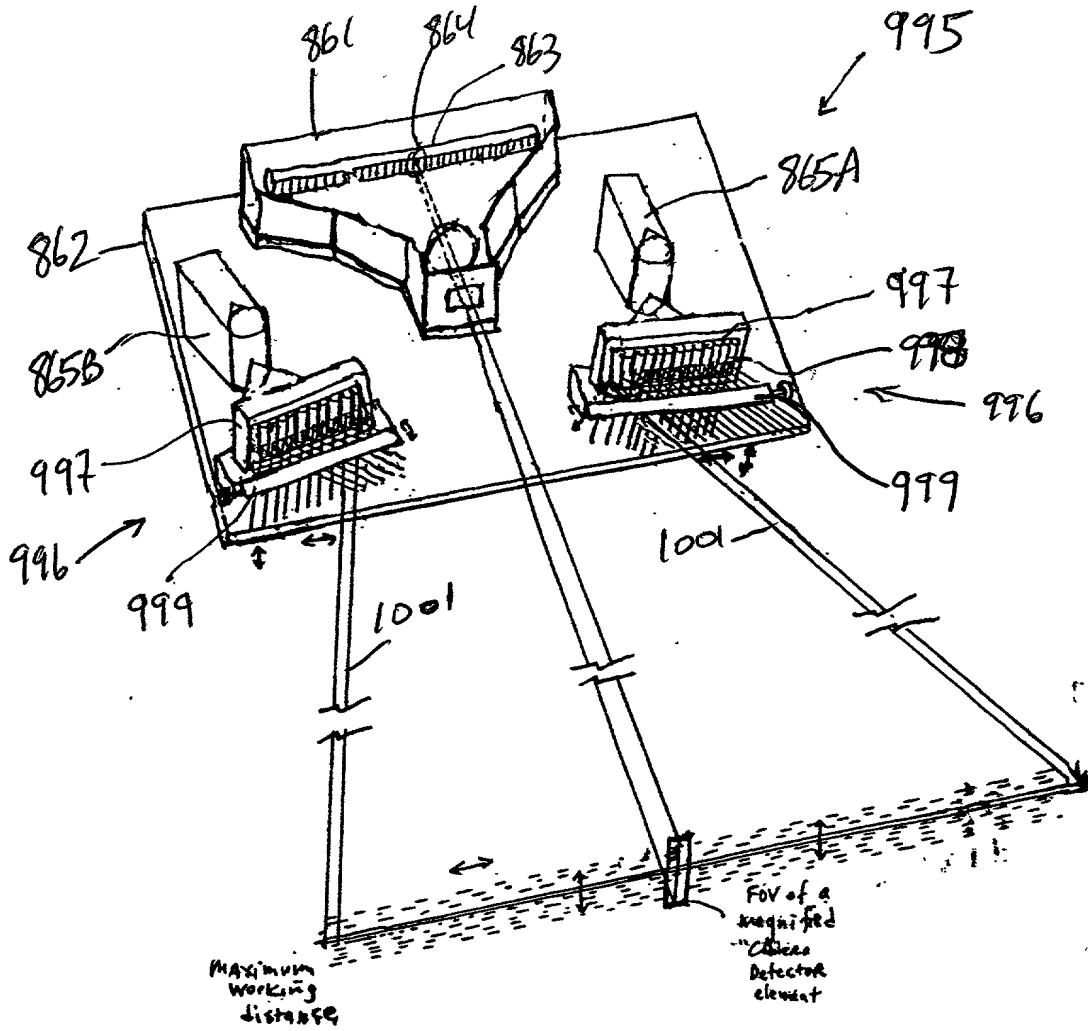


FIG. 1I25M2

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- * hybrid:
 - spatial intensity mod.
 - spatial phase

* Lateral and Transverse Microoscillation of PLIB

FIG. 1I25N1

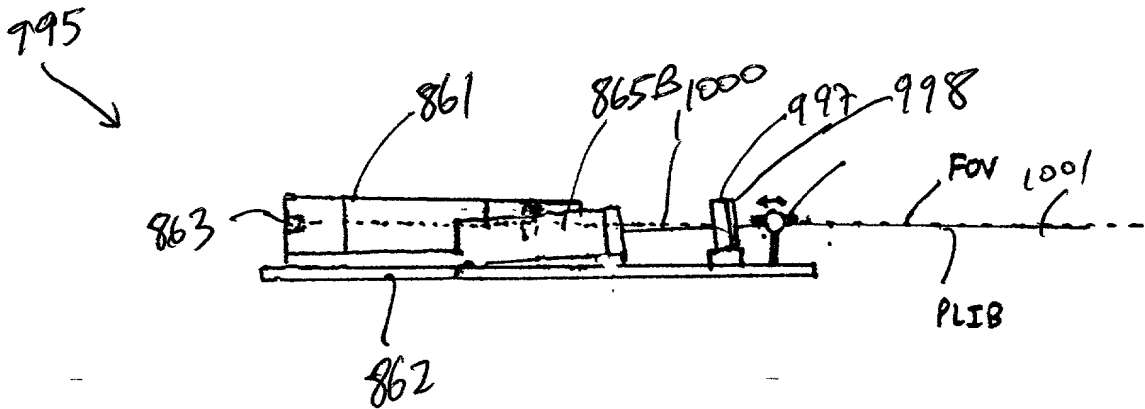


FIG. 1I25NZ

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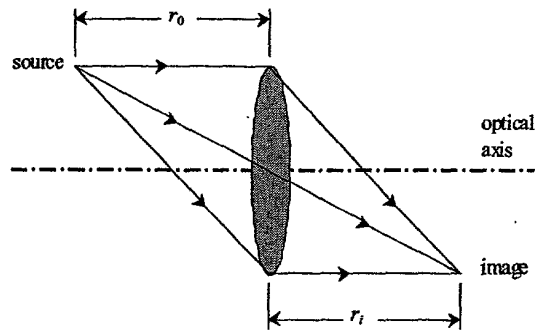


FIG. 1H1

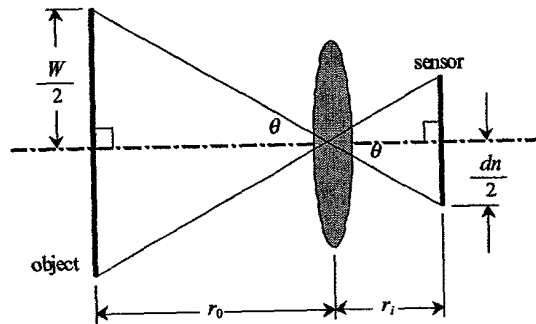


FIG. 1H2

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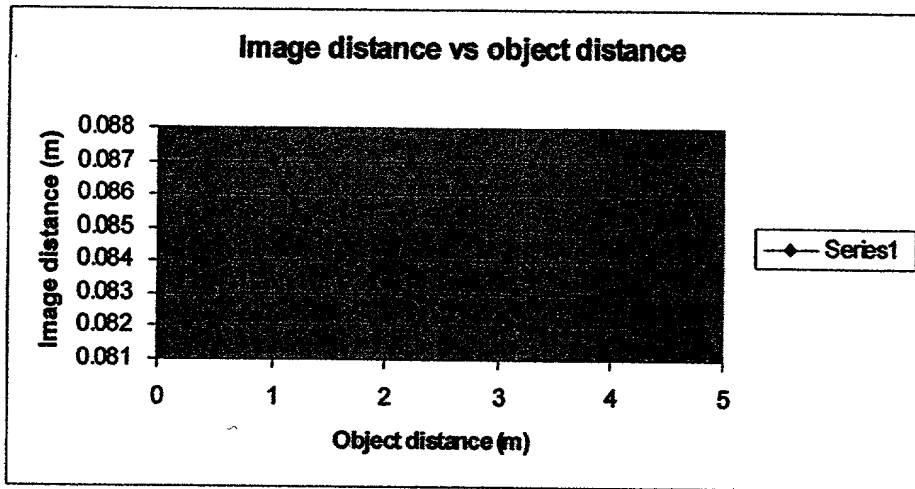


FIG. 1H3

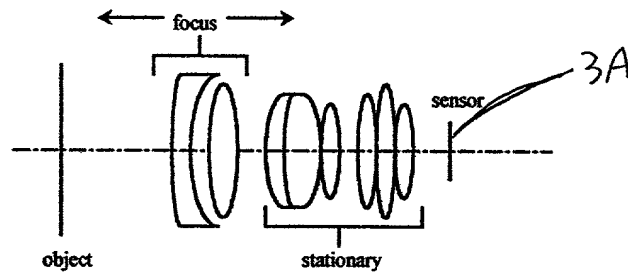


FIG. 1H4

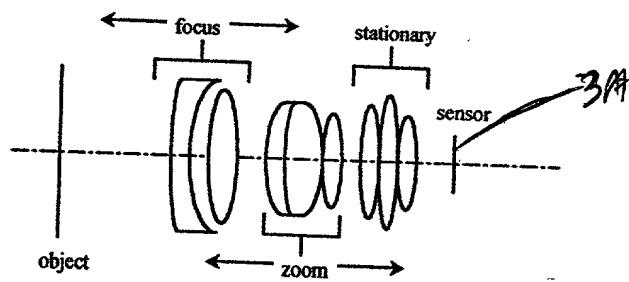
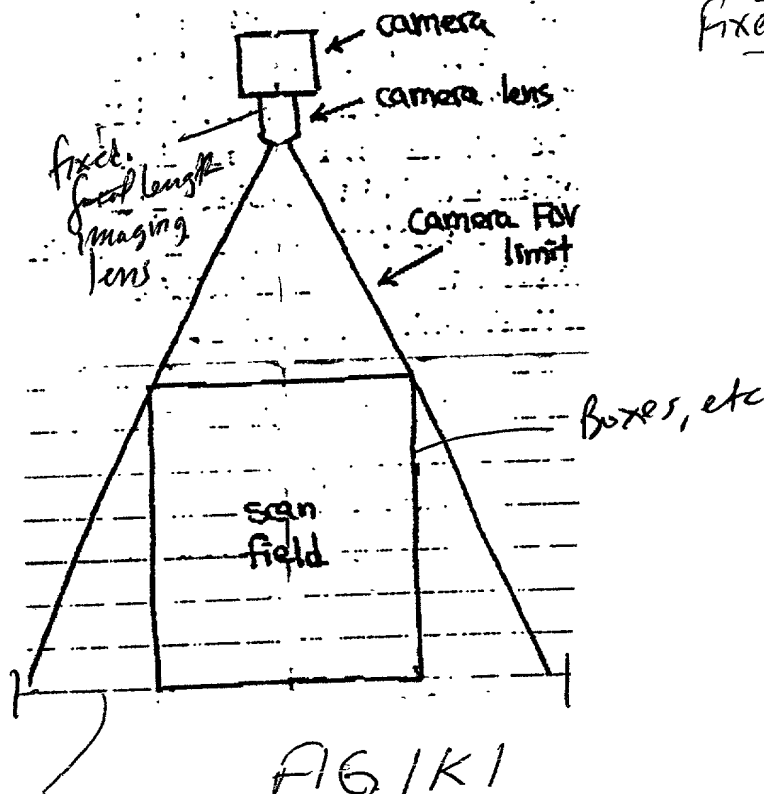


FIG. 1H5

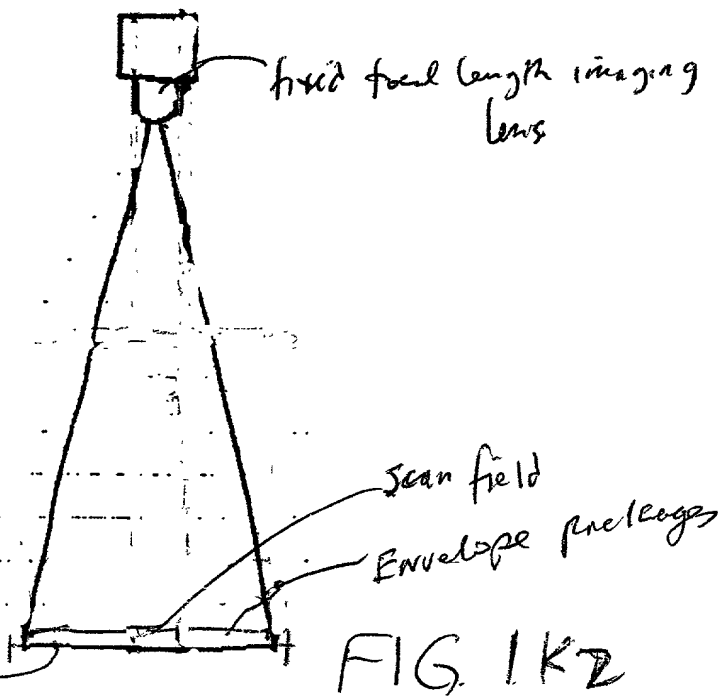
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Fixed focal length lens cases



conveyer 34

FIG. 1K1



conveyer 34

FIG. 1K2

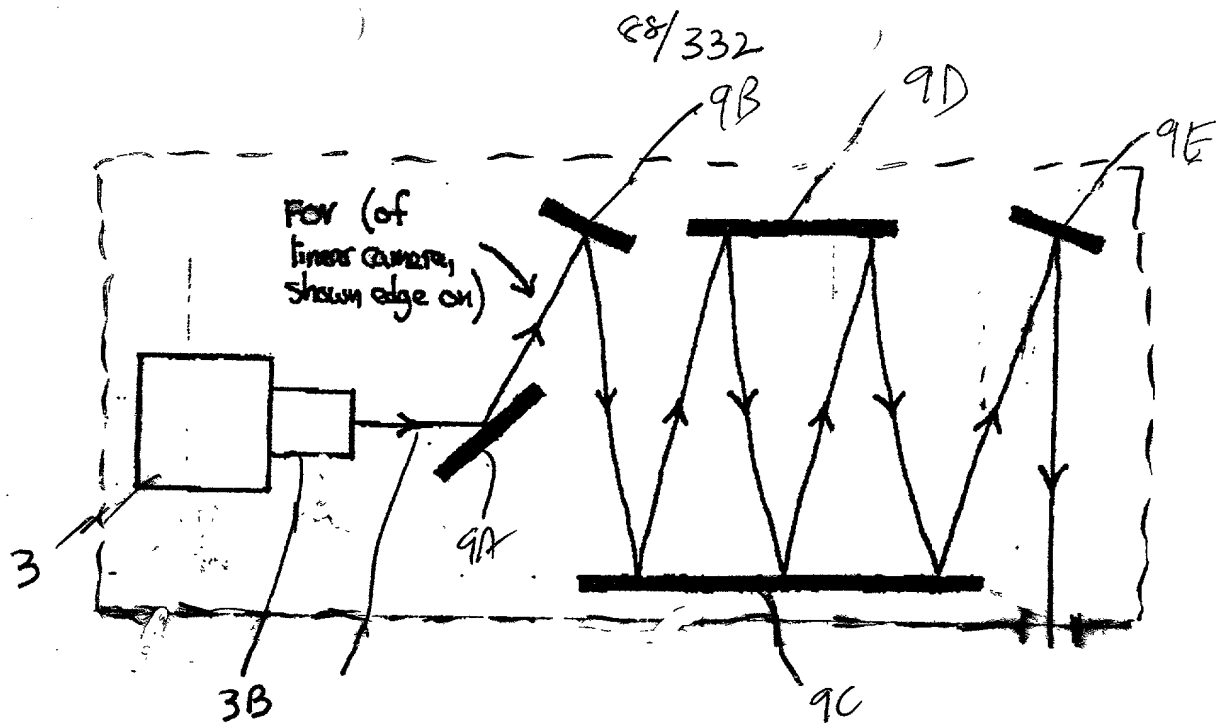


FIG. 1L1

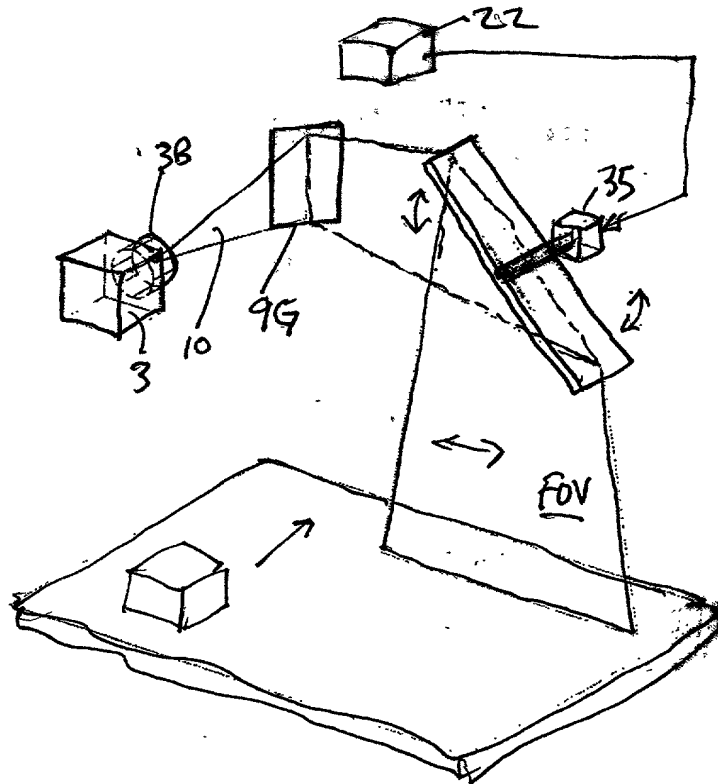


FIG. 1L2

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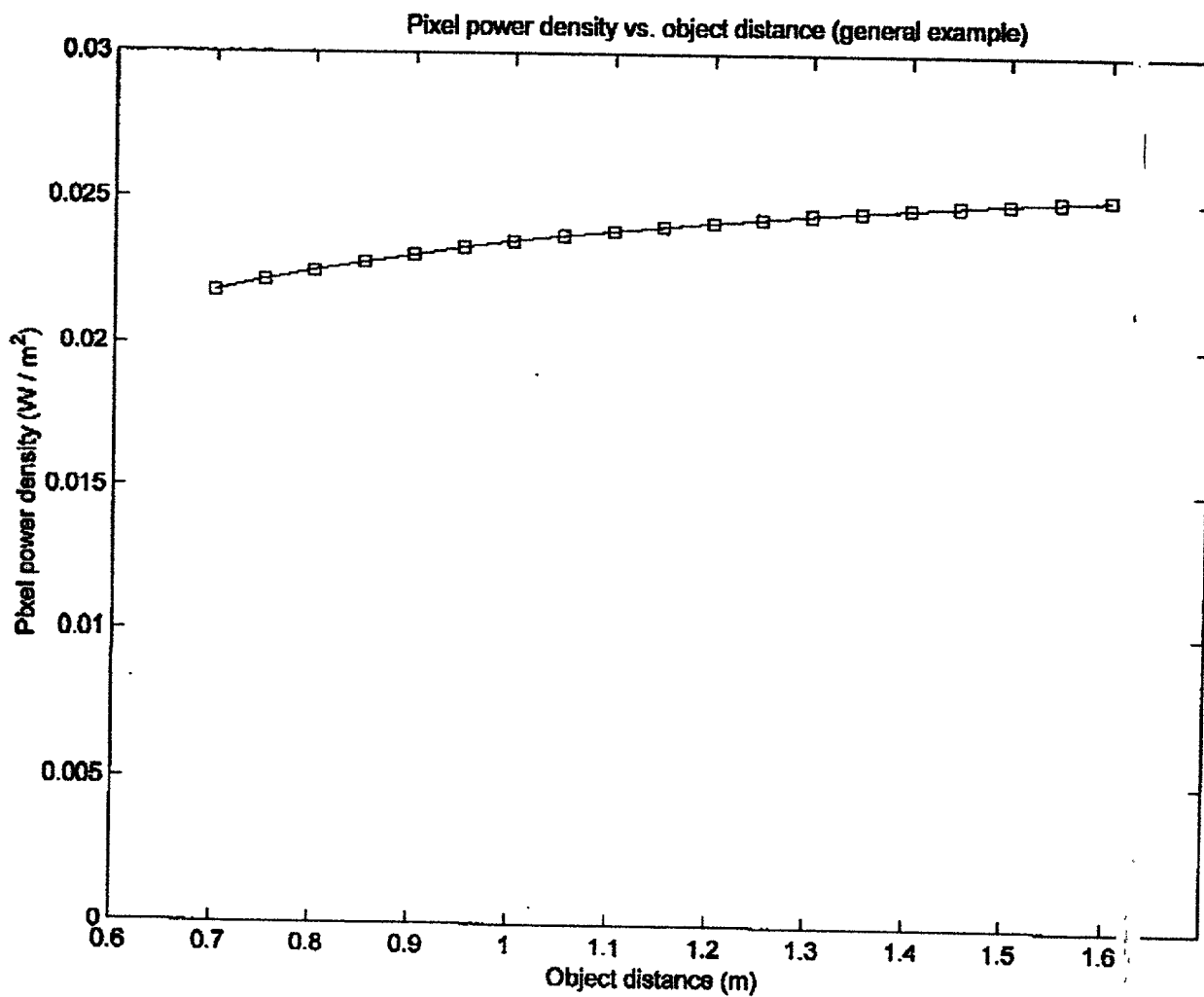


FIG-1M1

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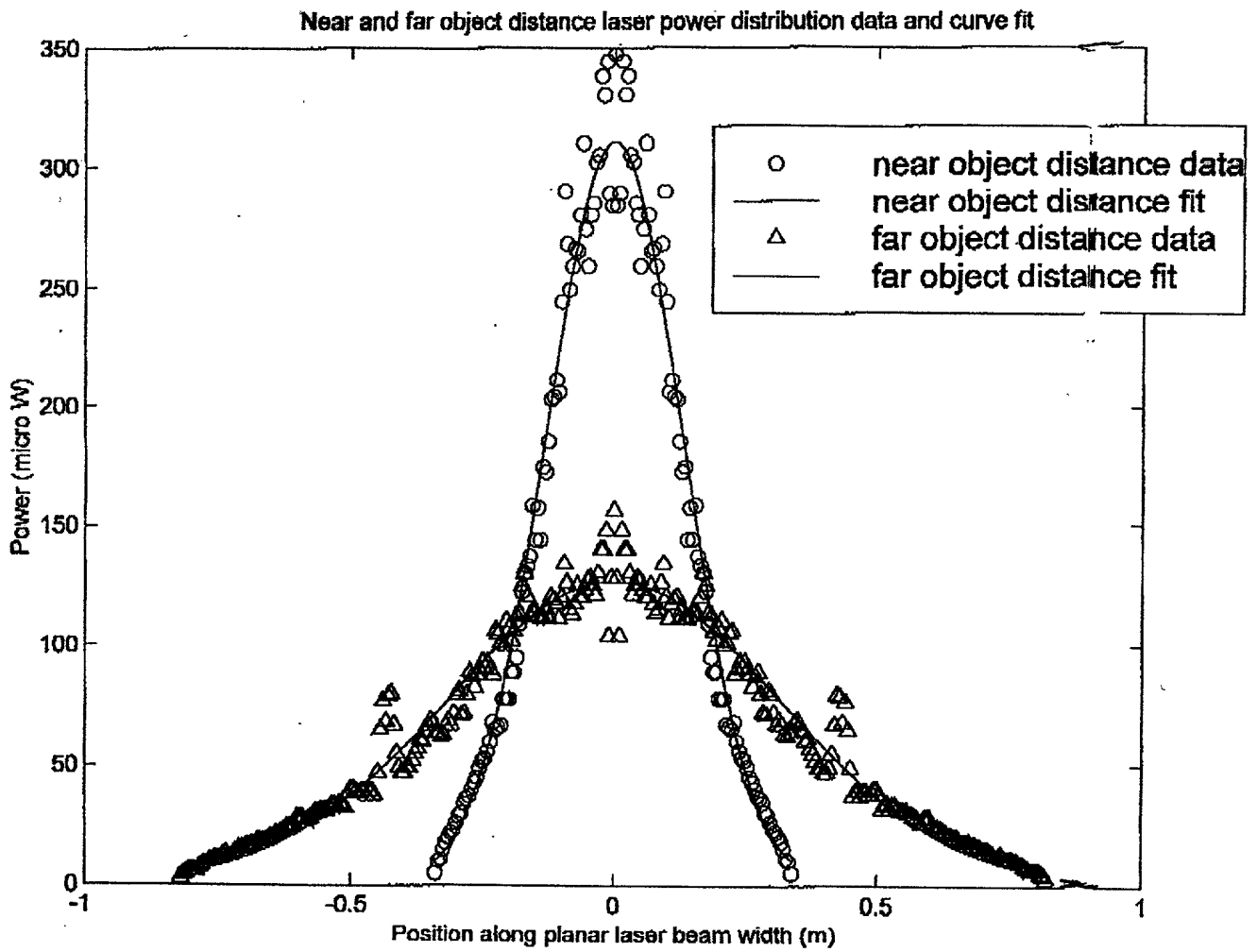


FIG. 1M2

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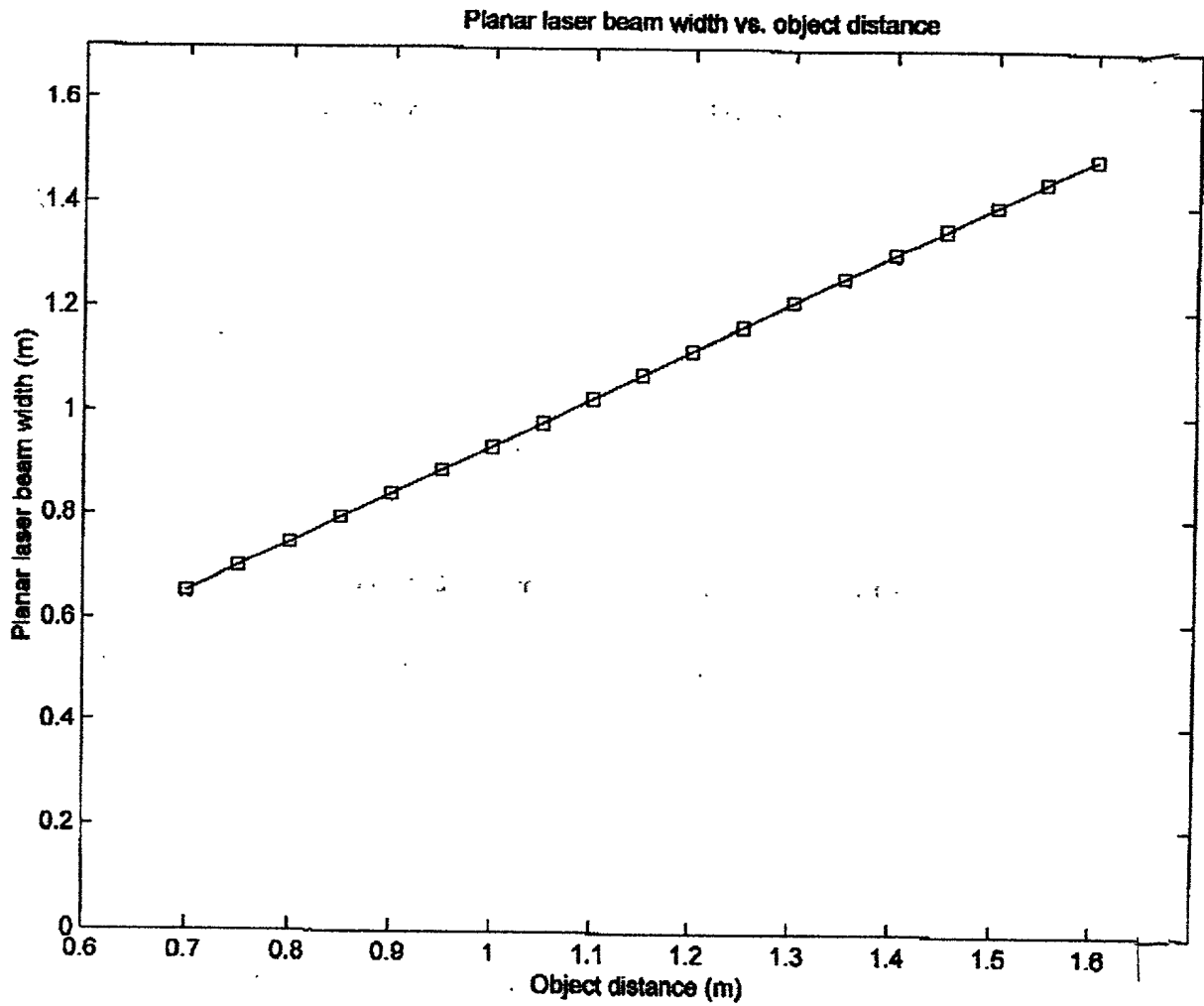


FIG. 1M3

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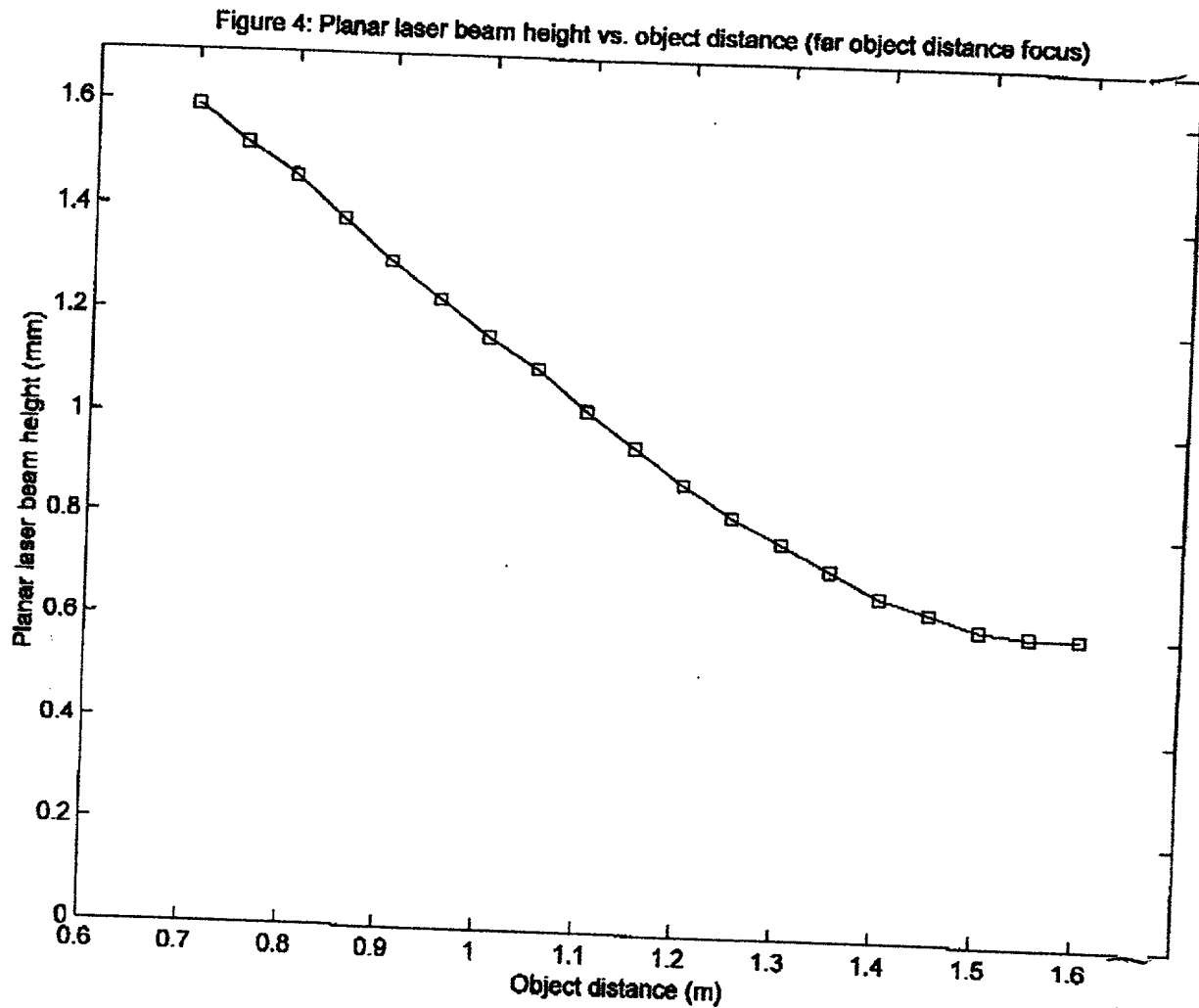


FIG 1M4

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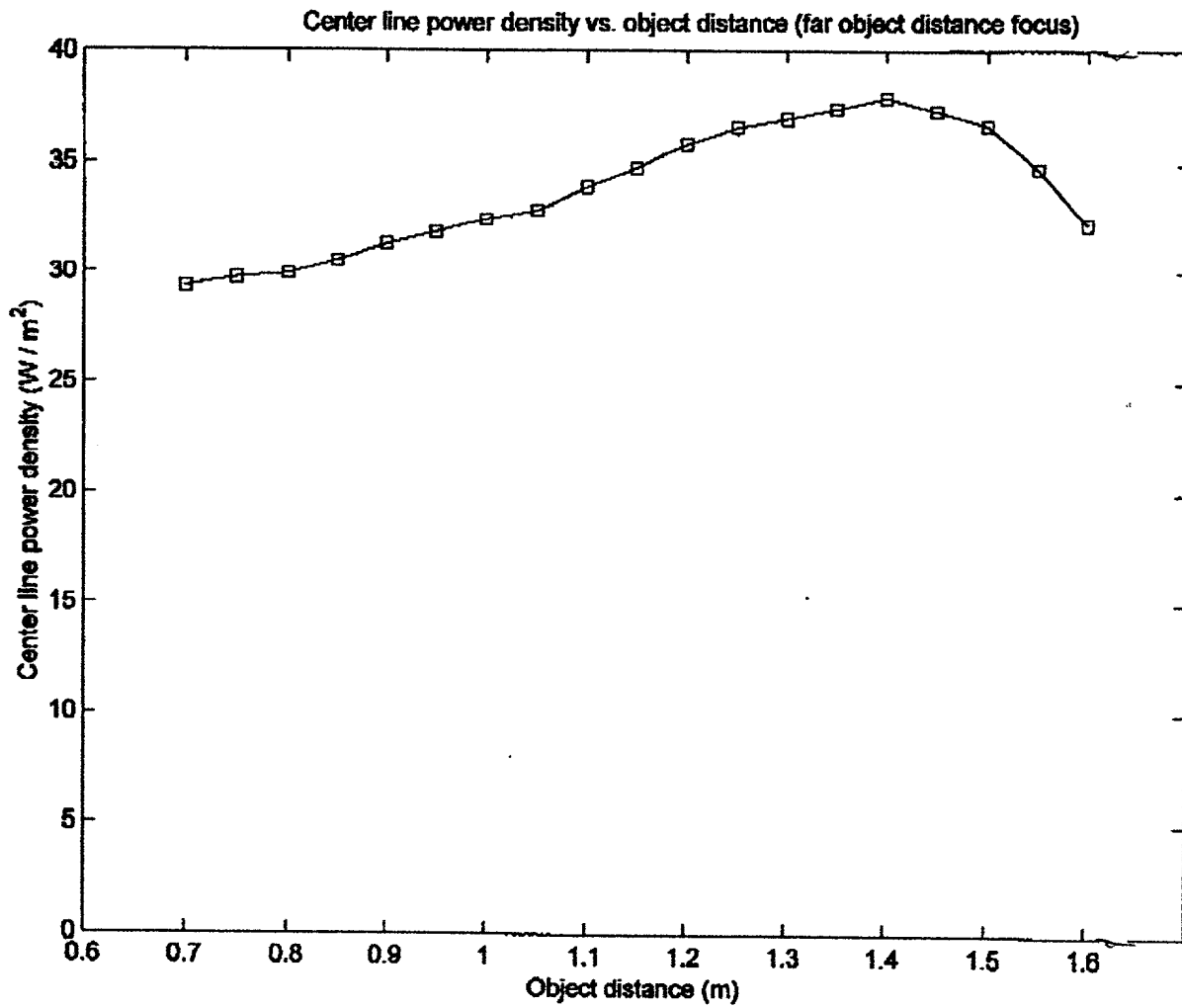


FIG. 1N

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Figure 6: Pixel power densities vs. object distance

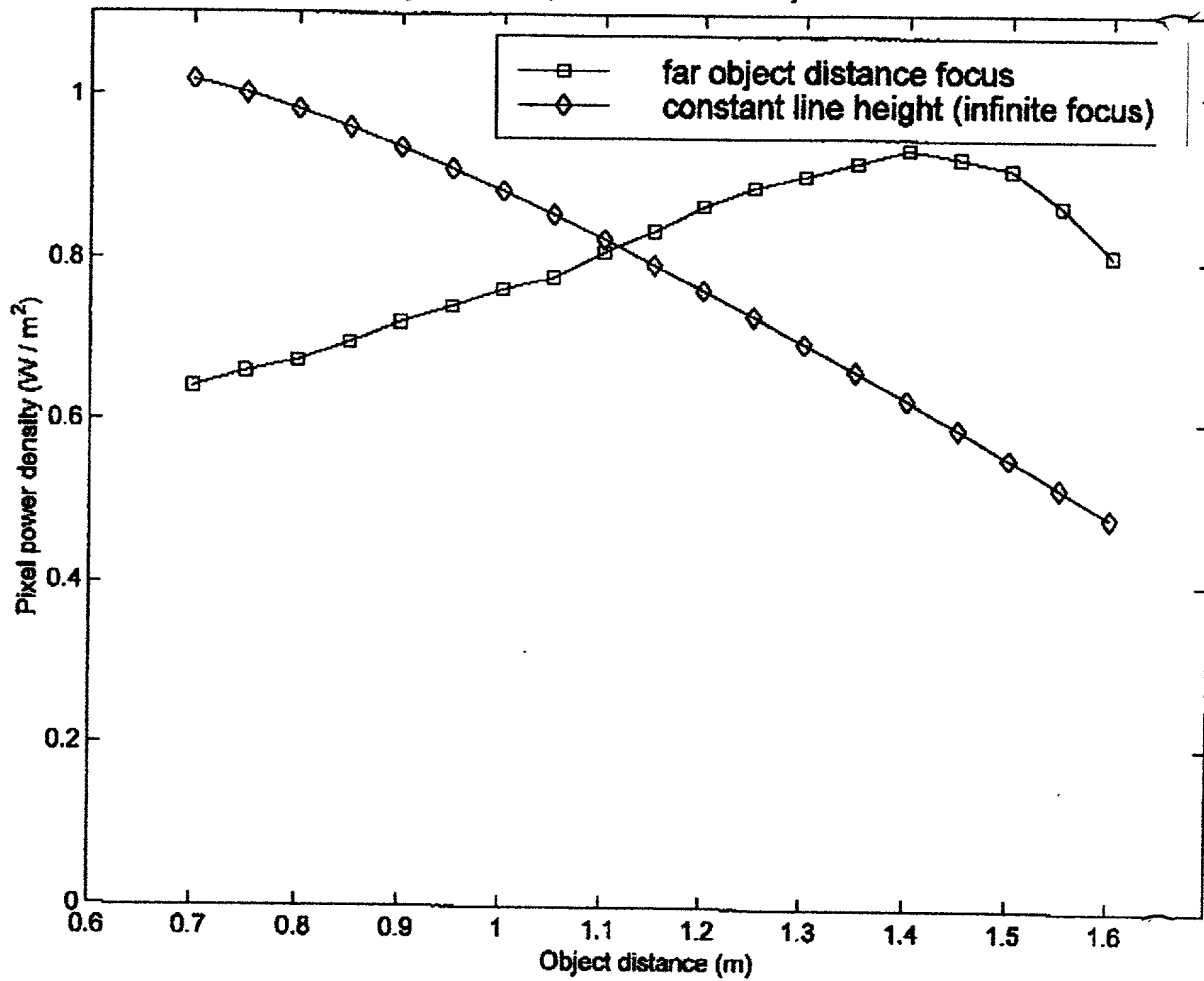


FIG. 10

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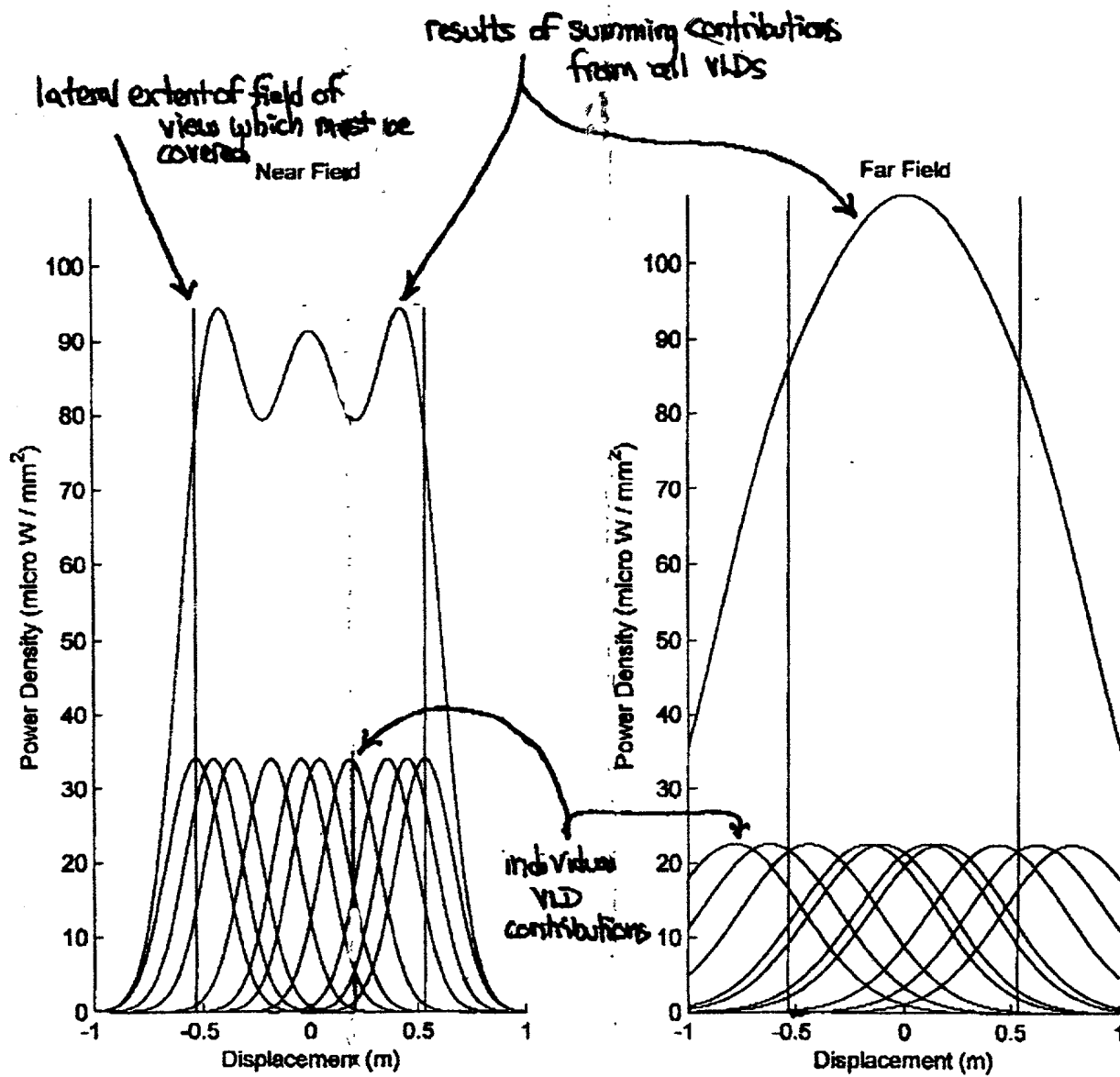


FIG 1P1

FIG 1P2

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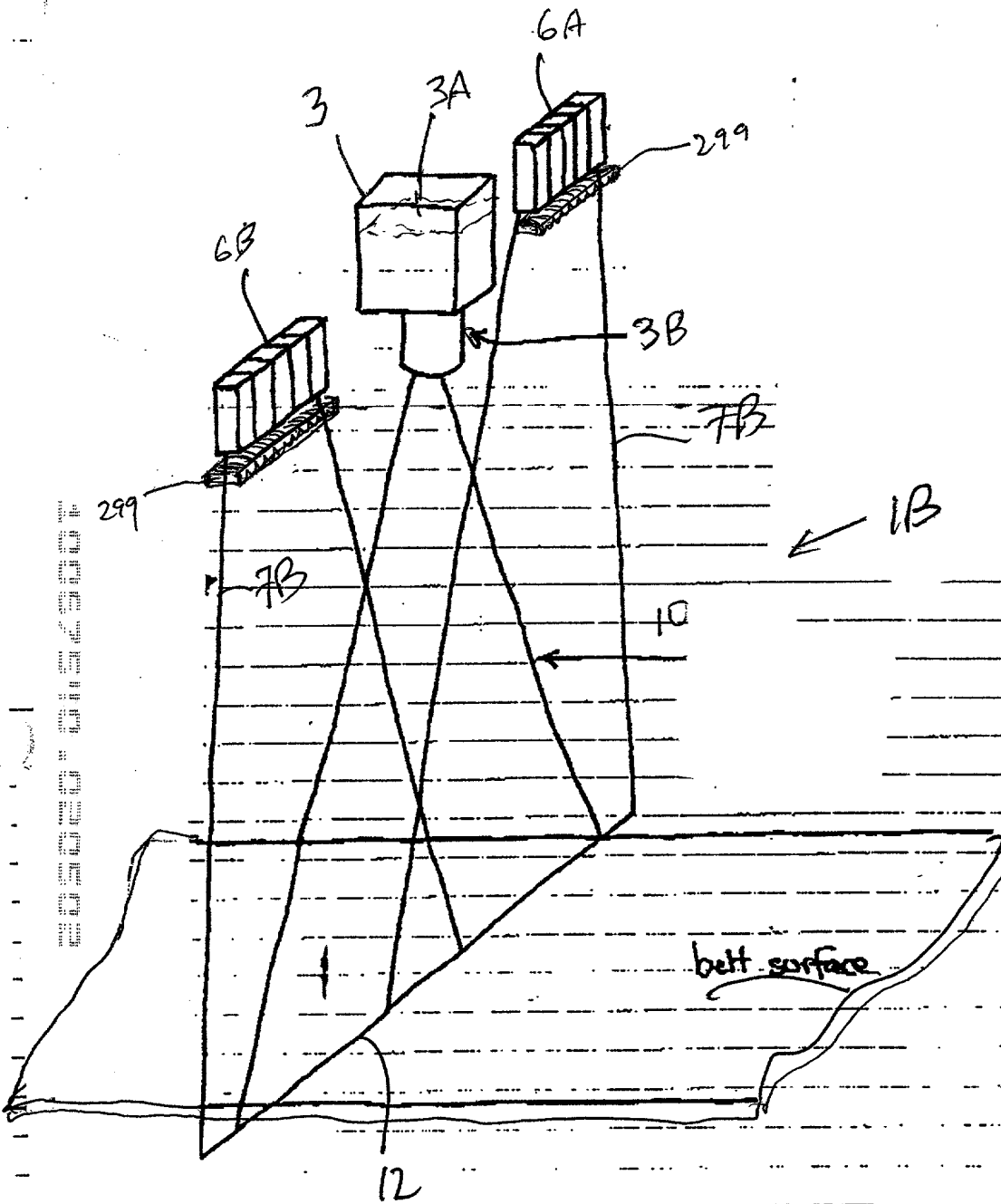


FIG. 1Q1

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fixed focal length / fixed distance

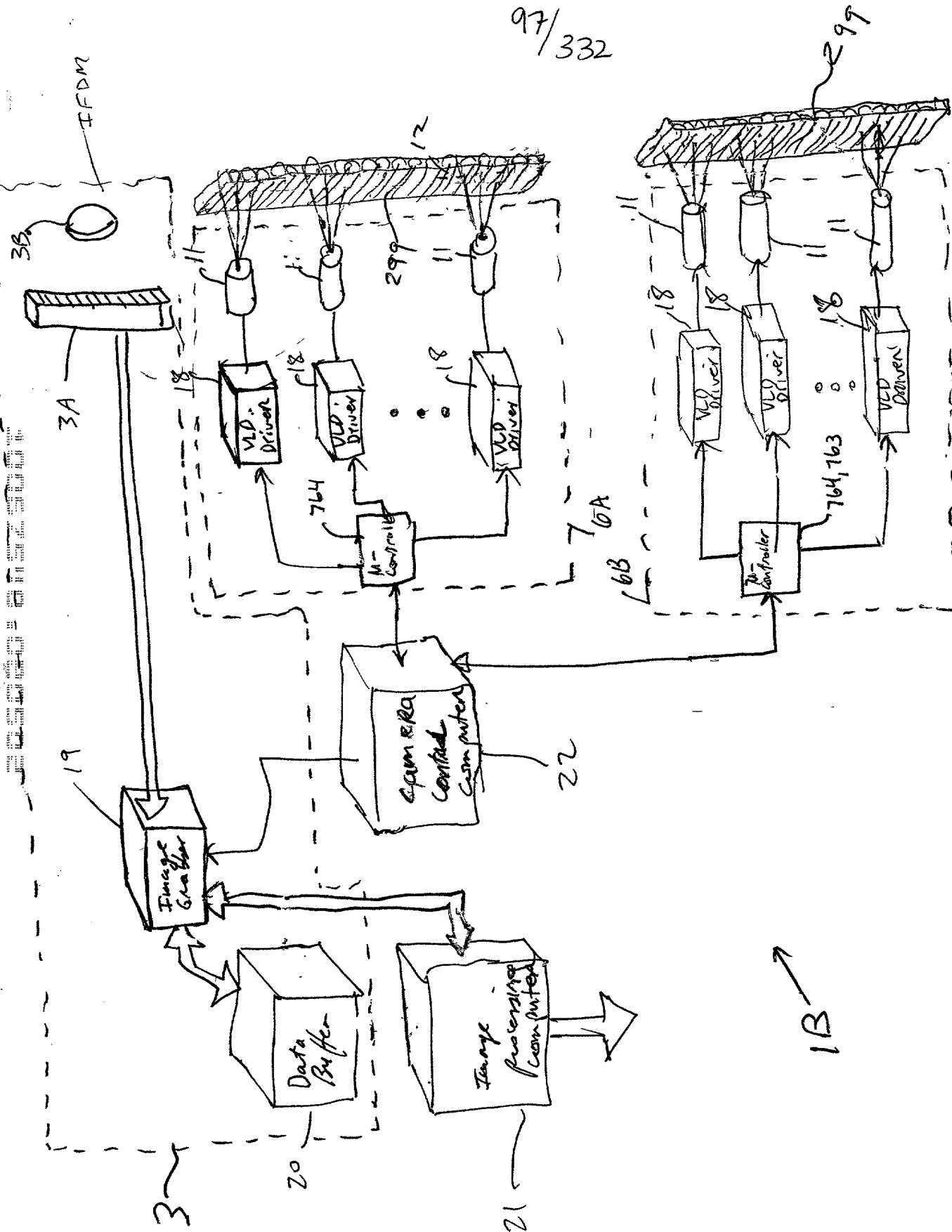
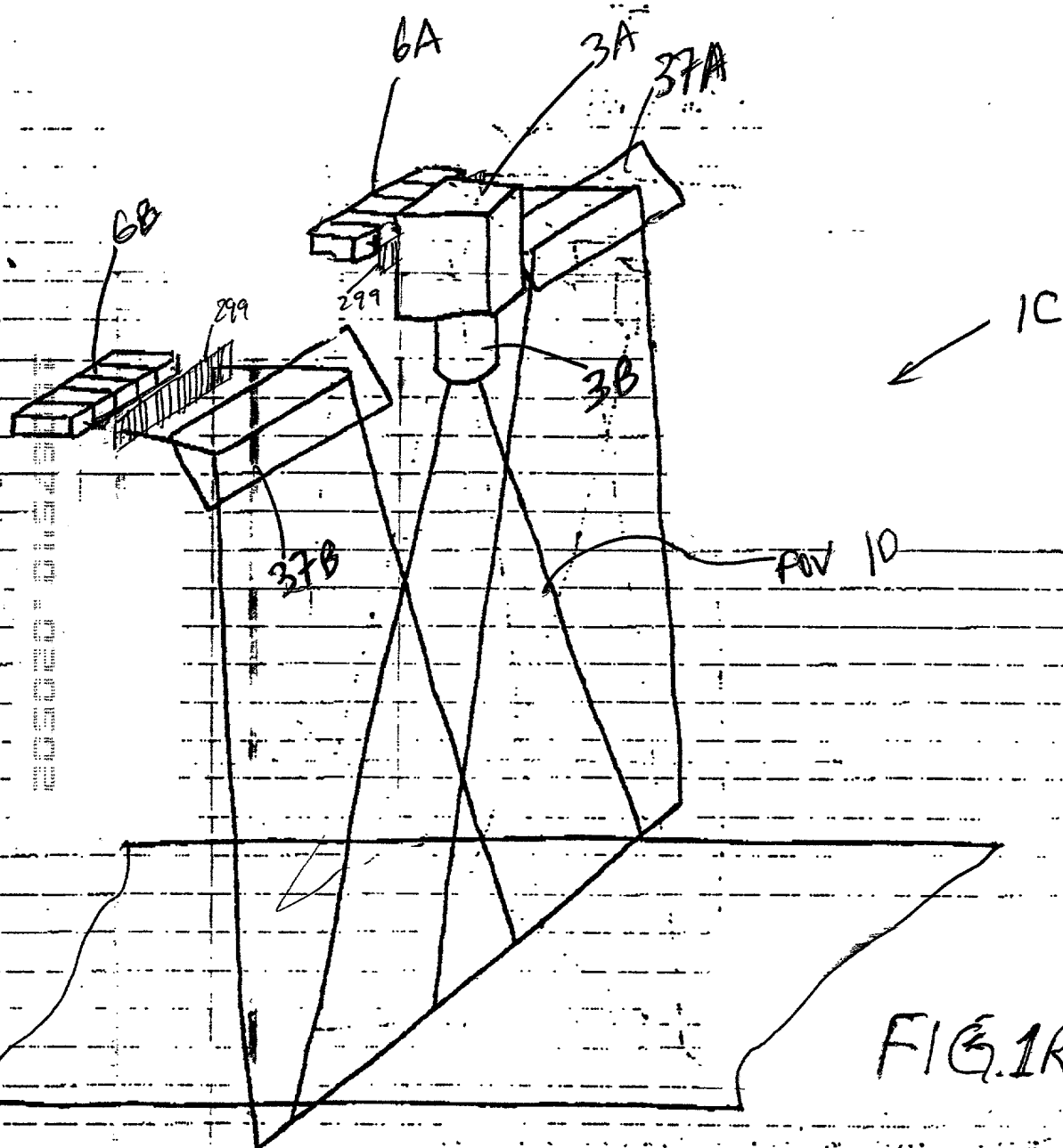
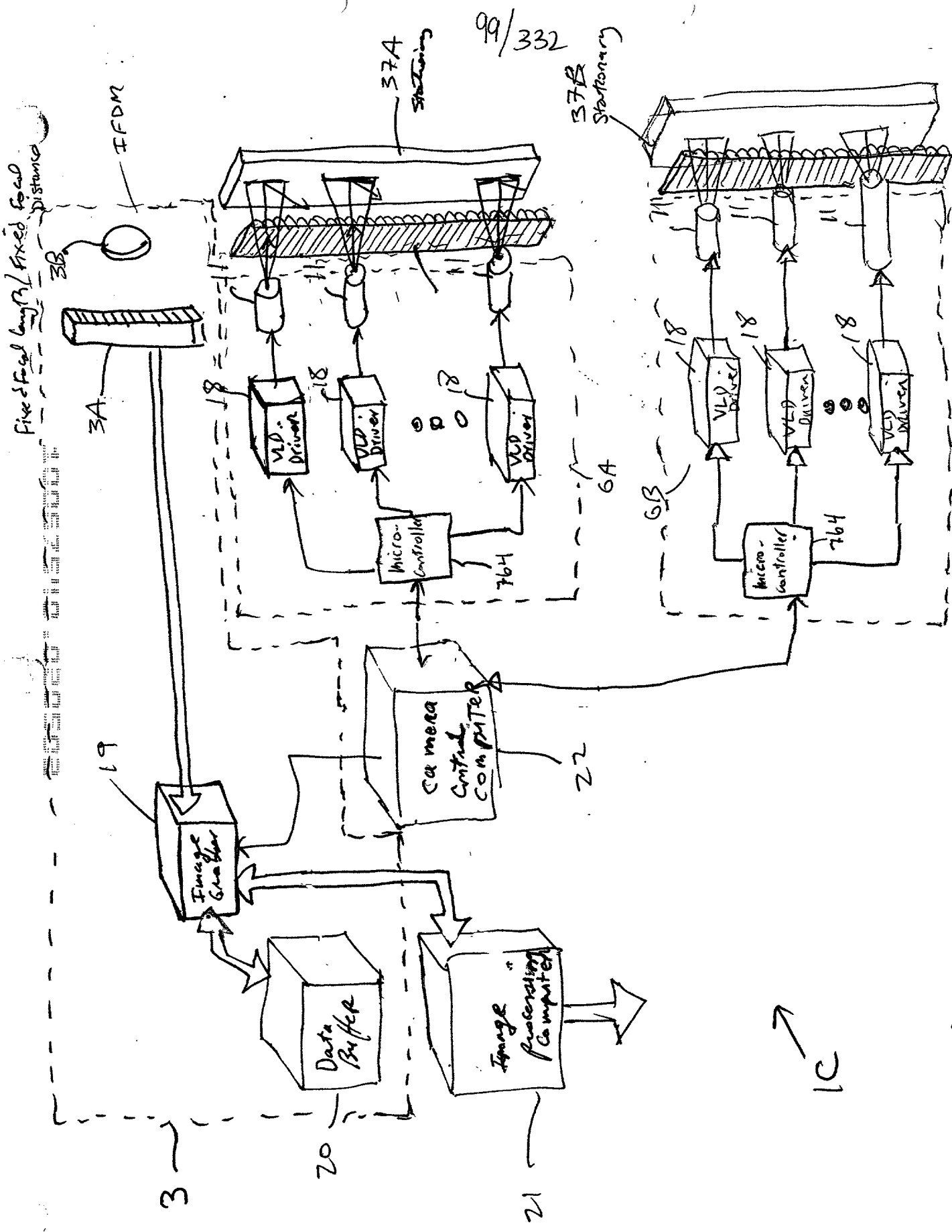


FIG. 100Z





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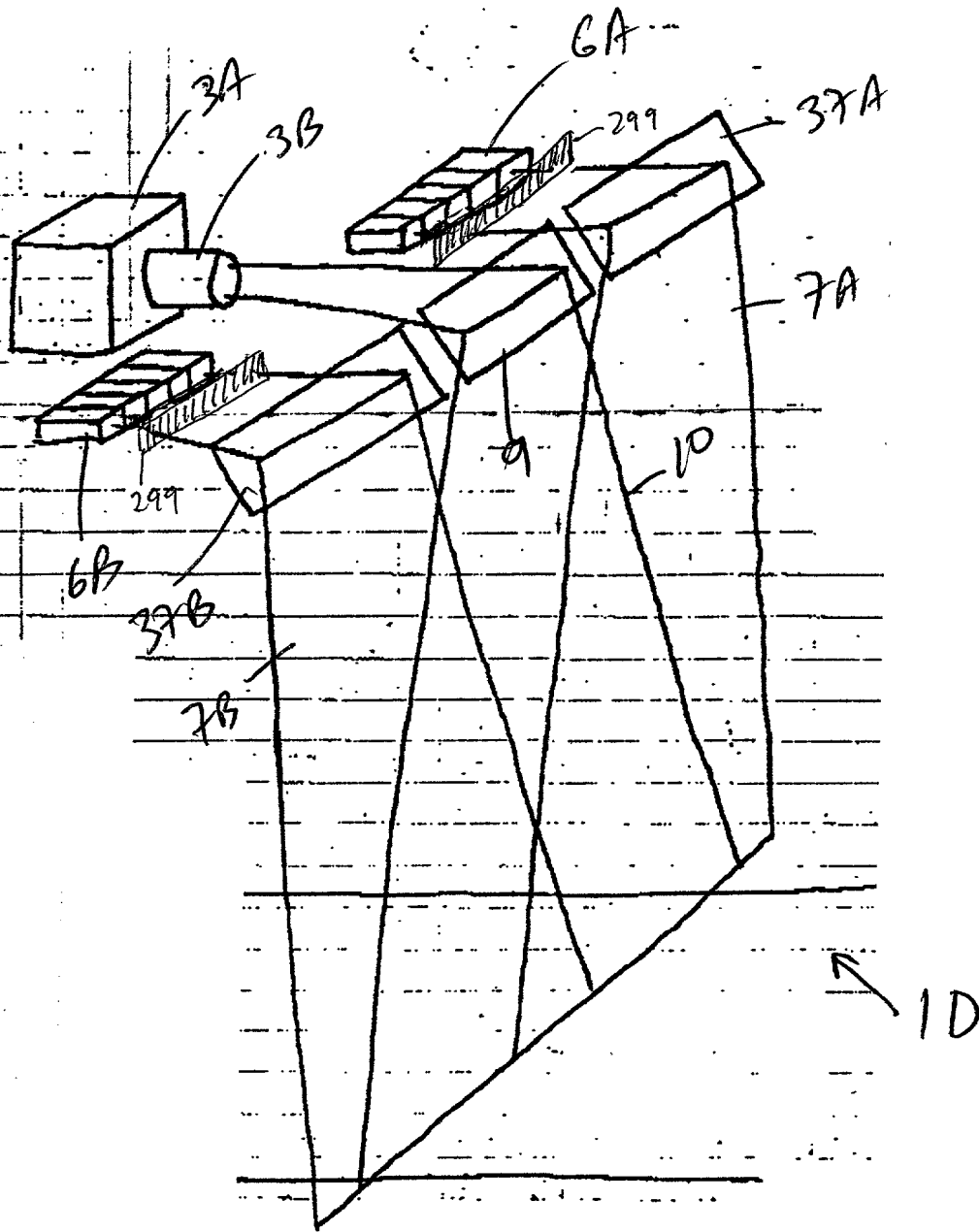


FIG. 1S1

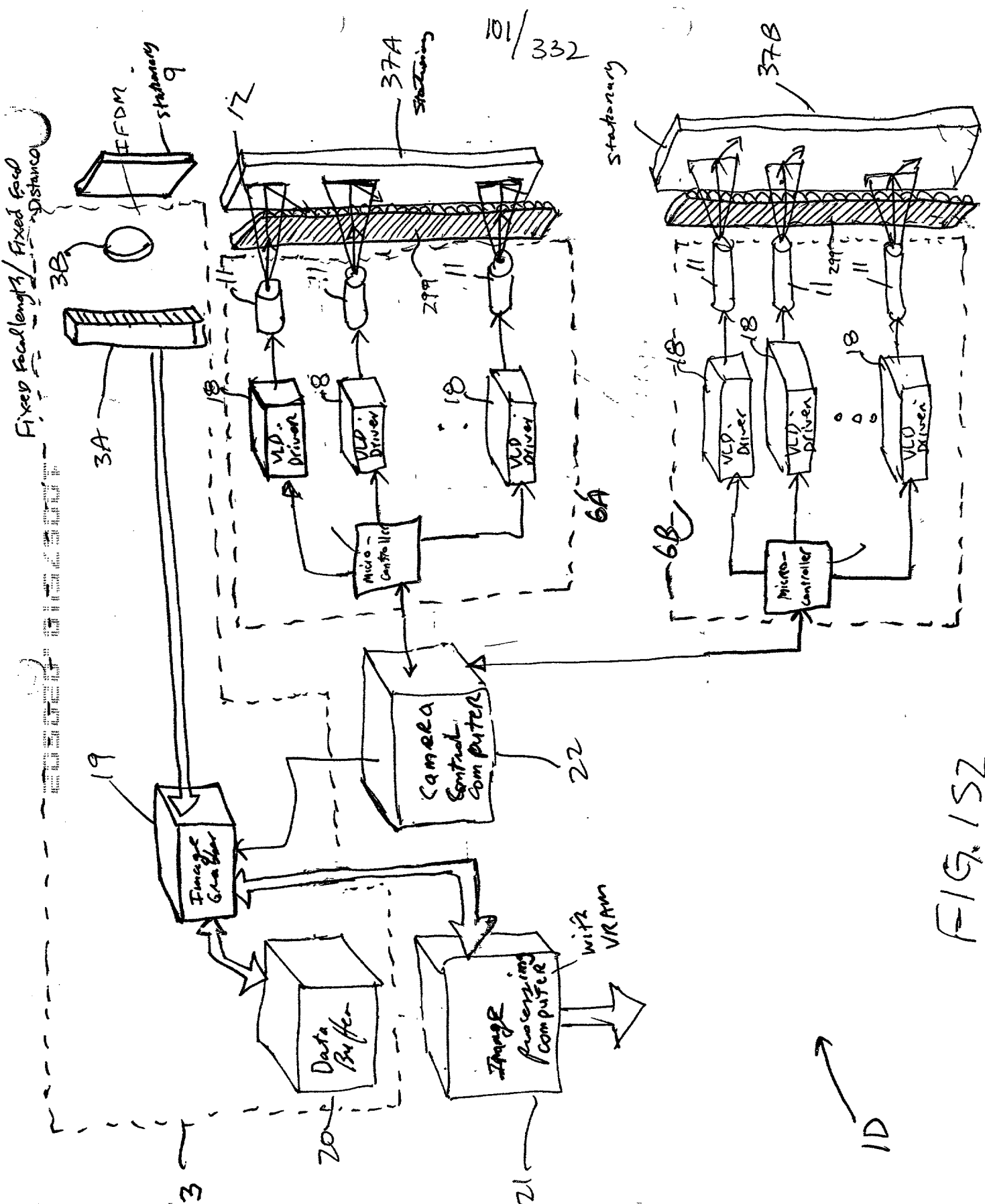


FIG. 152

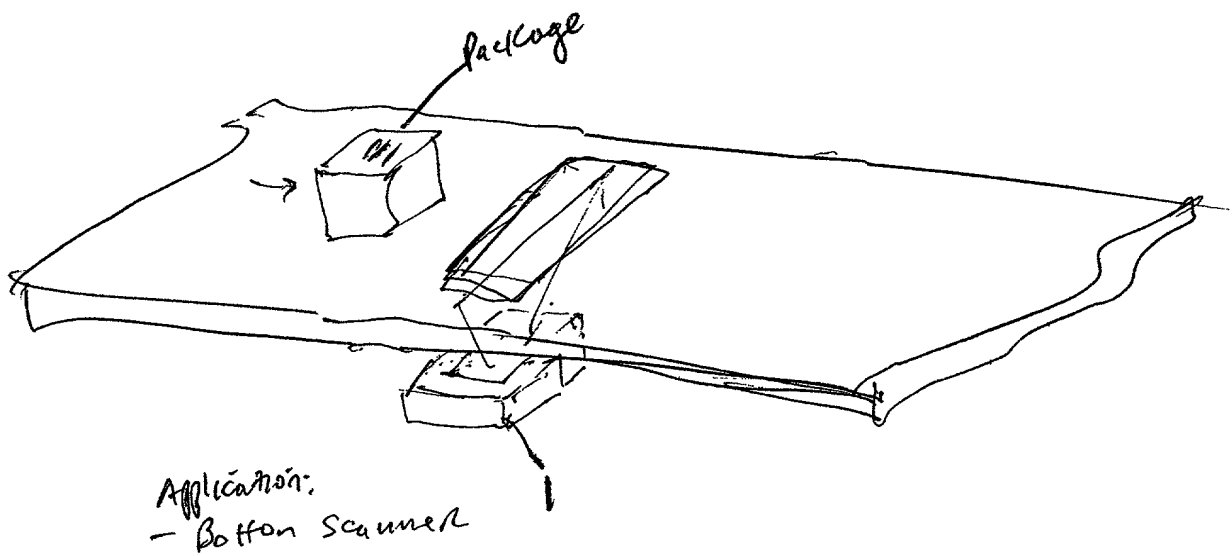


FIG 1T

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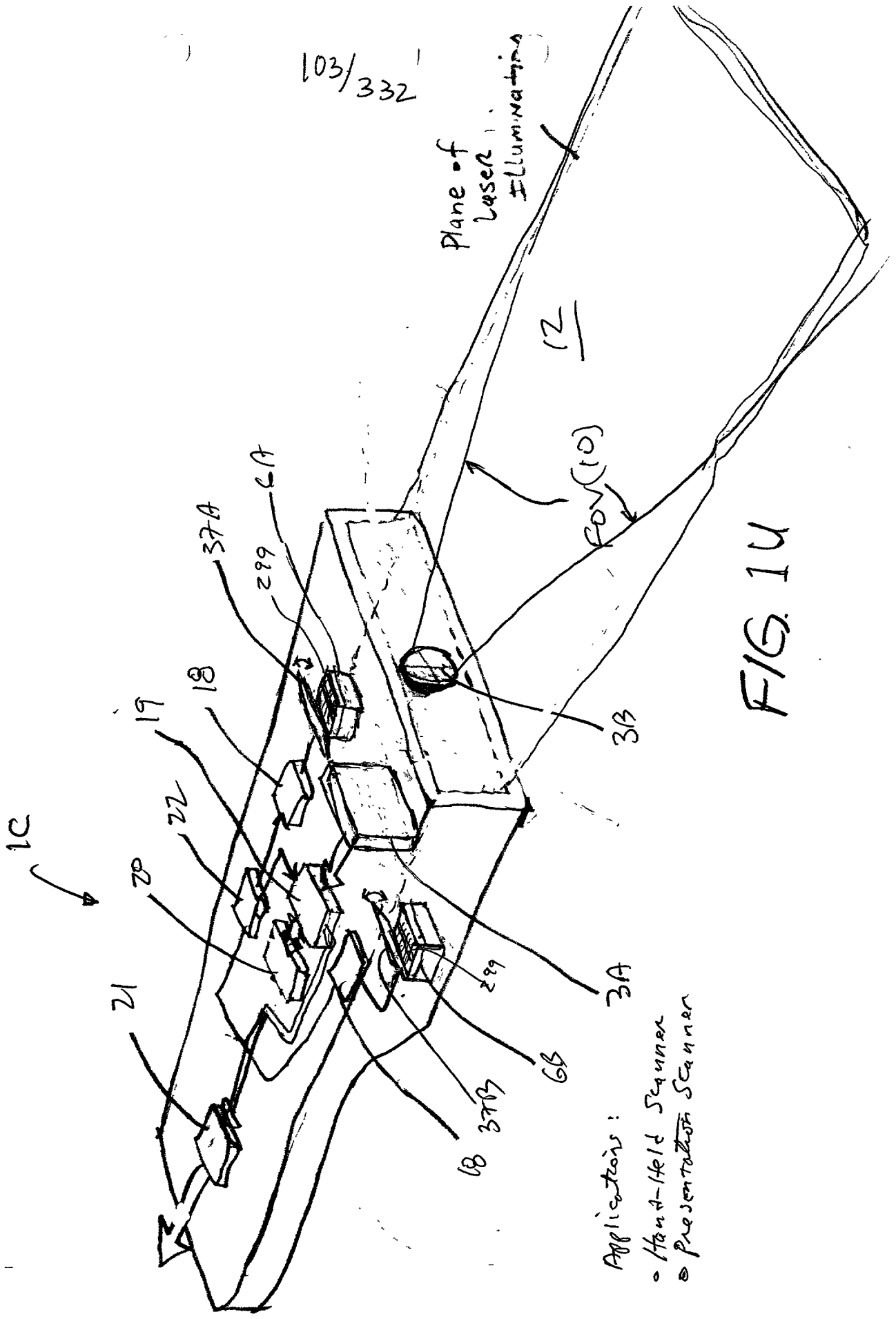


FIG. 1U

- Applications:
- Hand-Held Scanner
 - Presentation Scanner

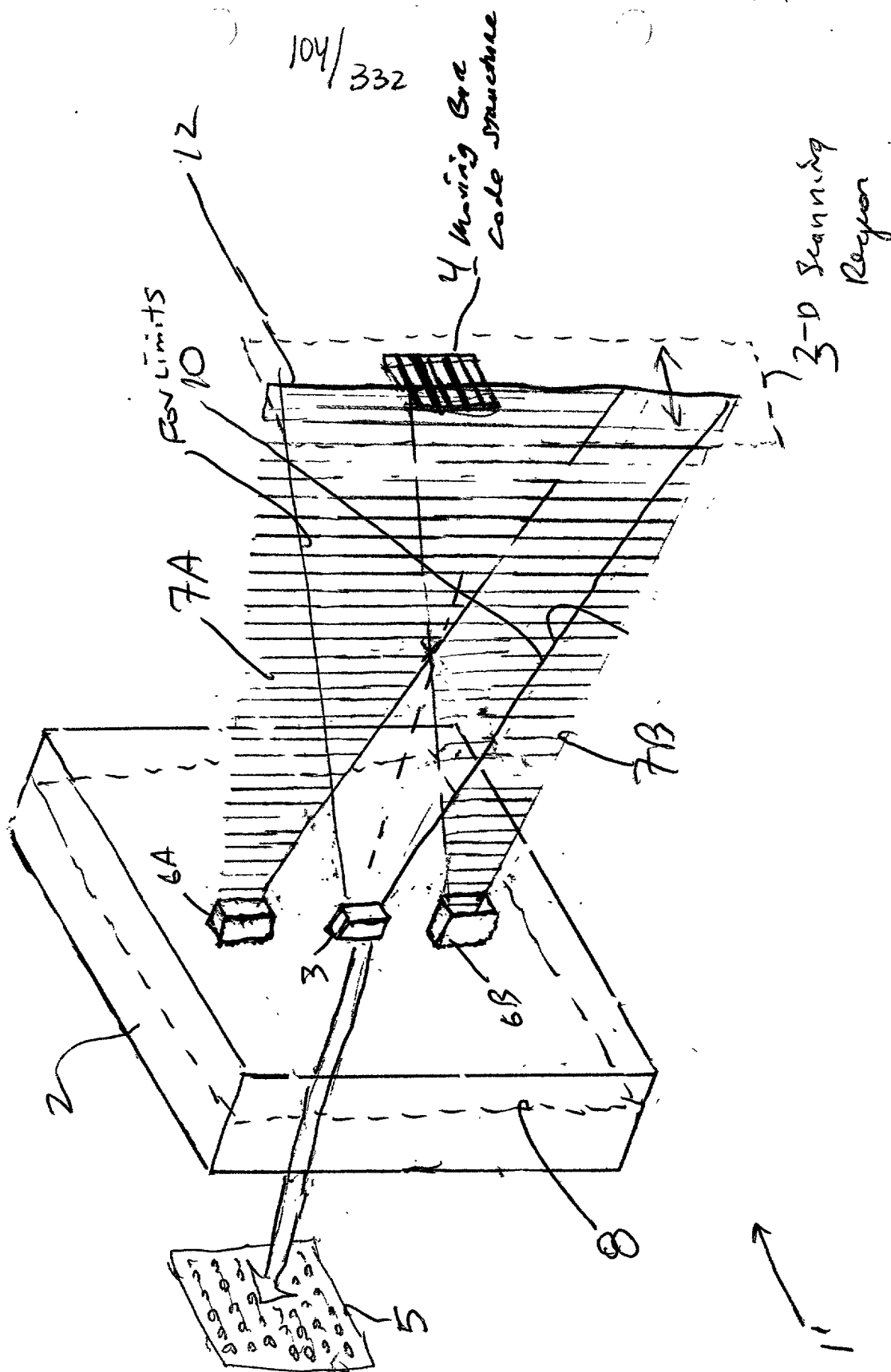


FIG. IVI

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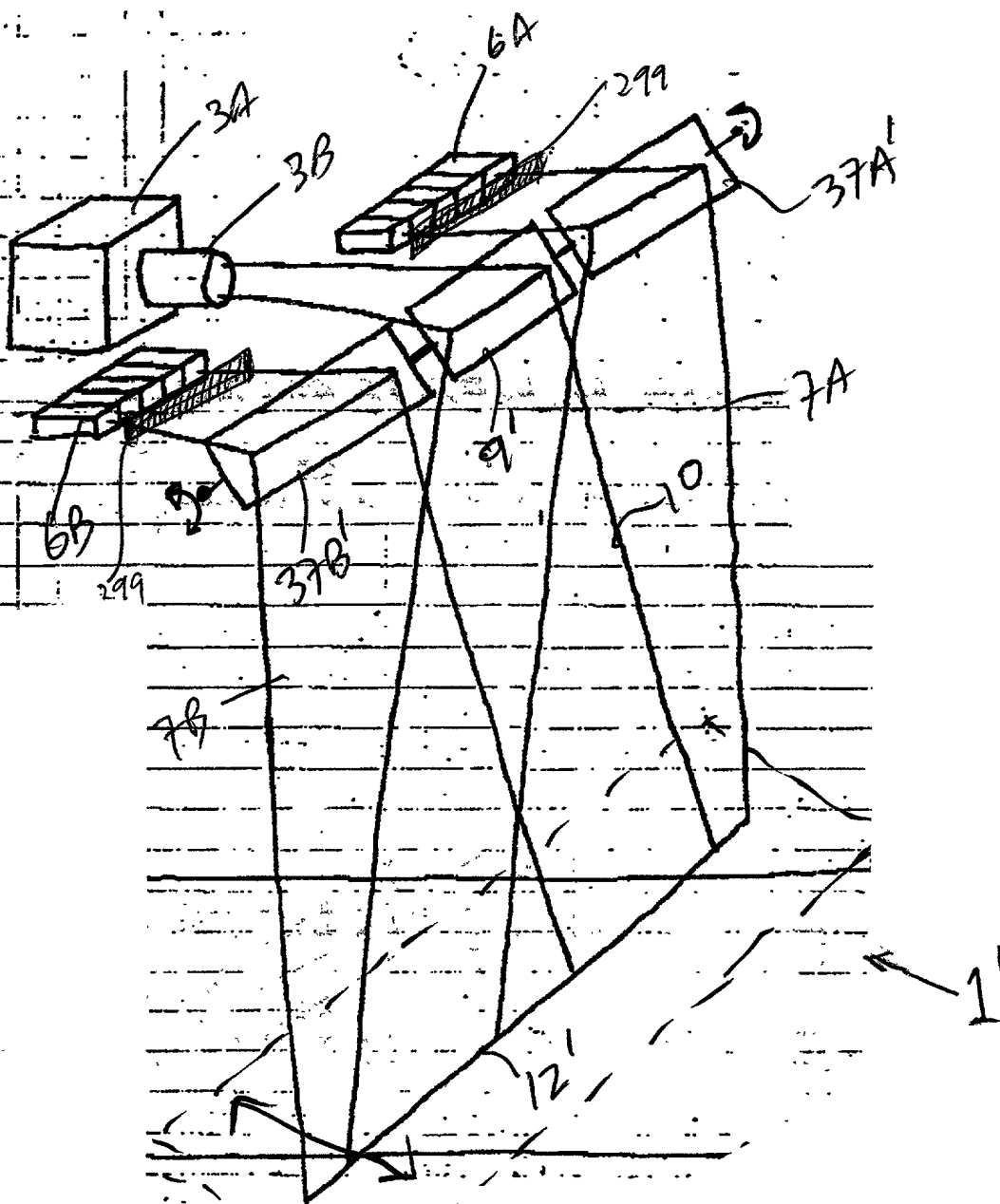


FIG. IV2

3-D
region
of
space

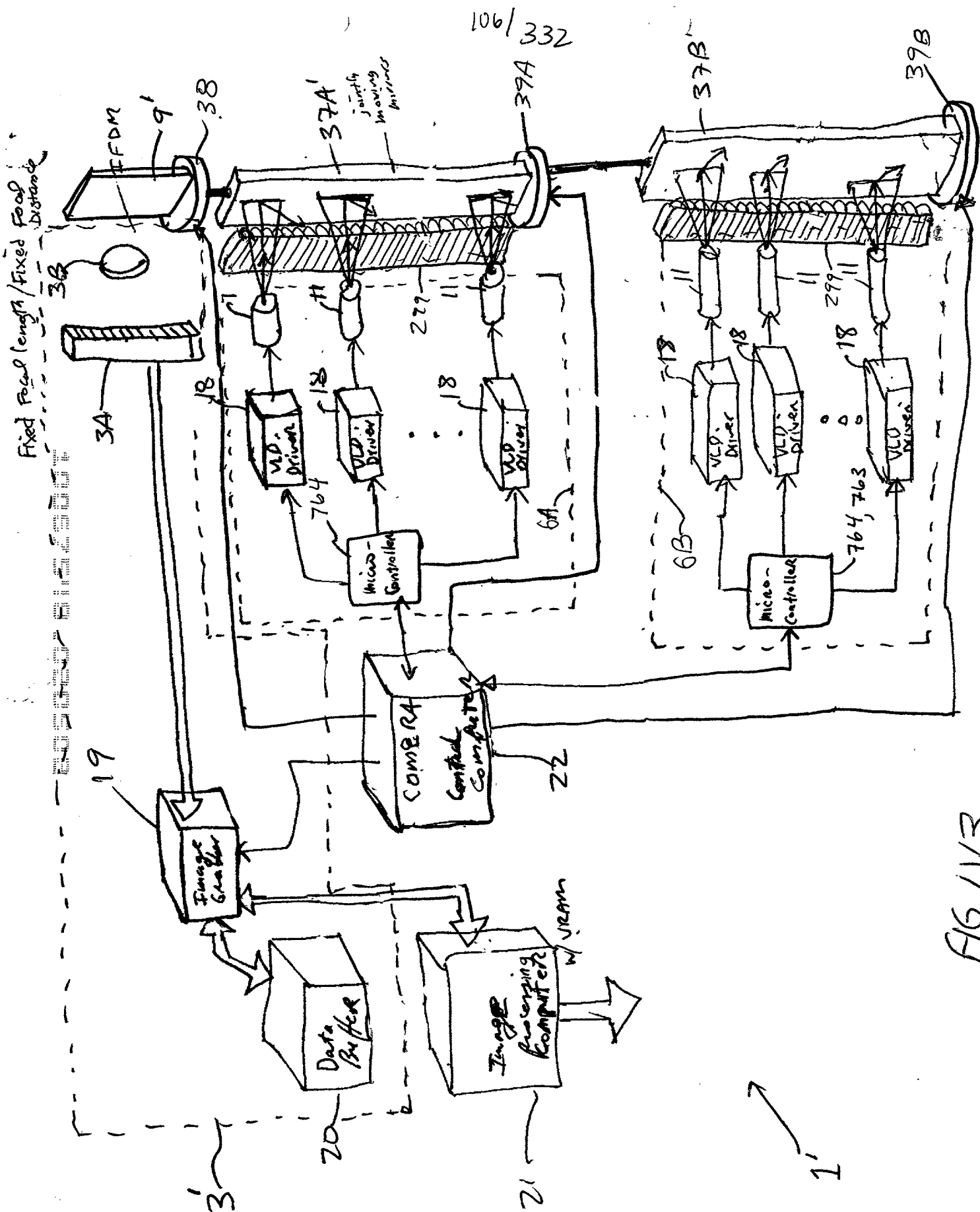


FIG. 1V3

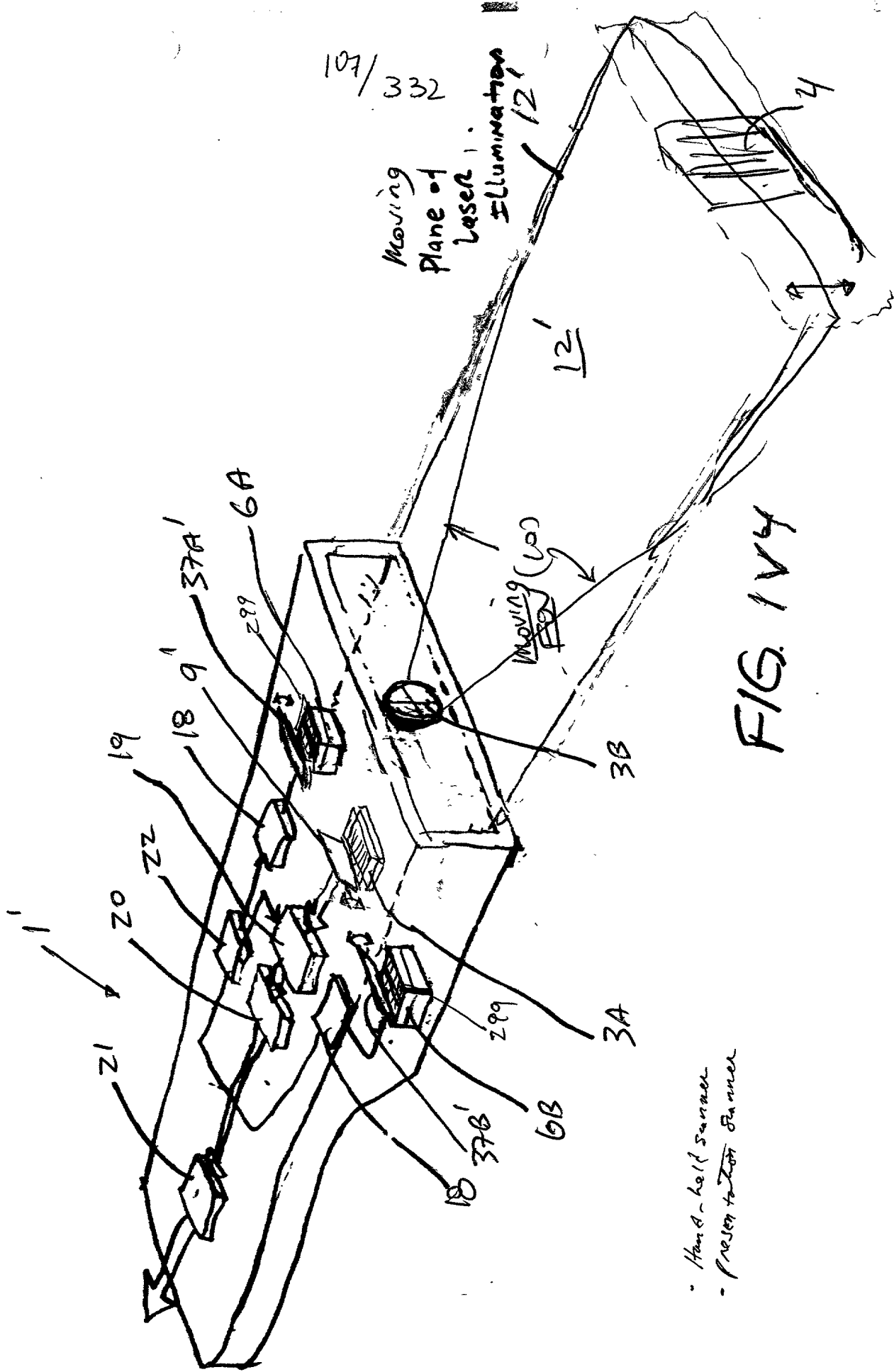


FIG. 1V4

- Hand-held scanner
- Projector to ~~scan~~ banner

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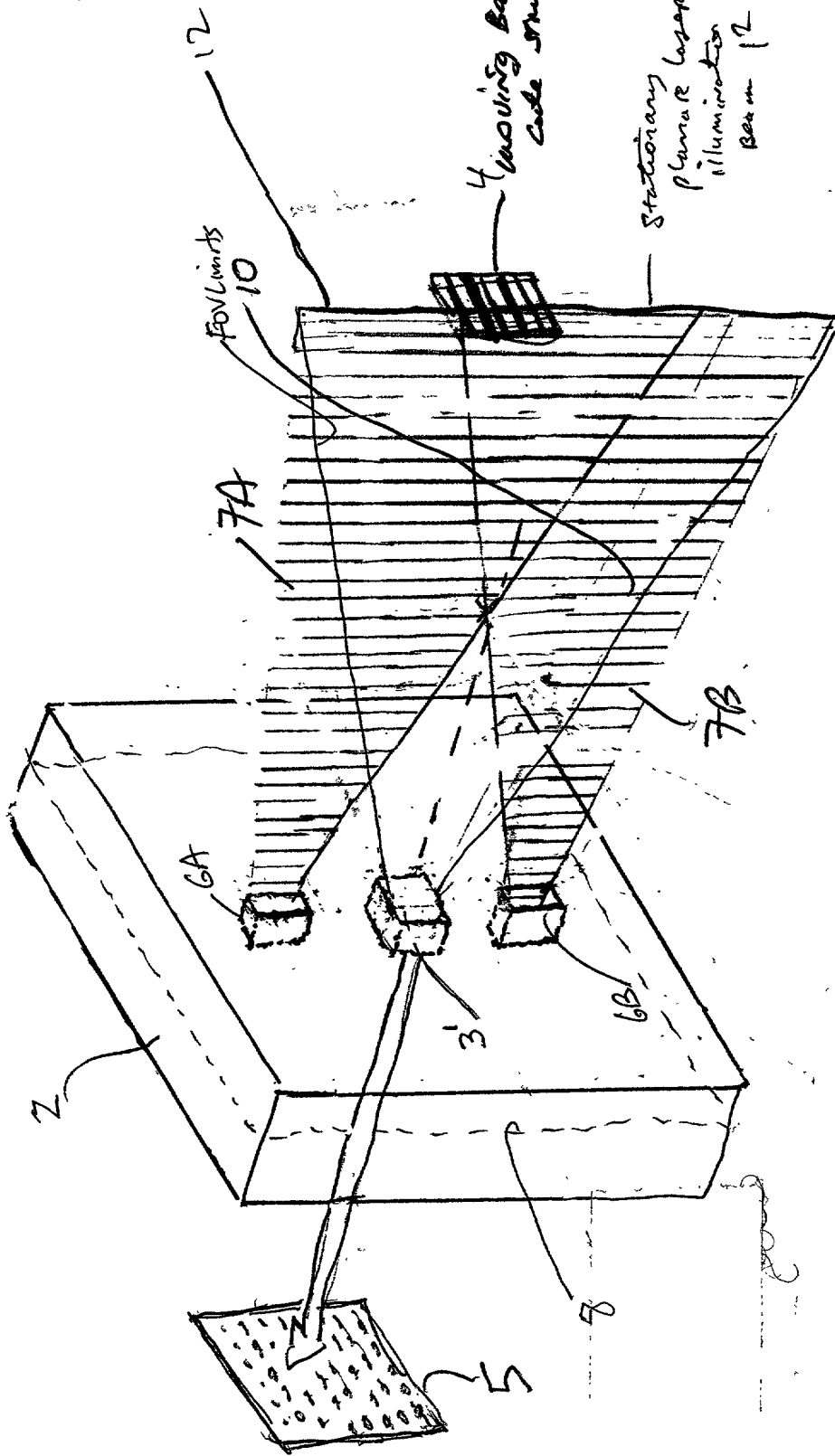
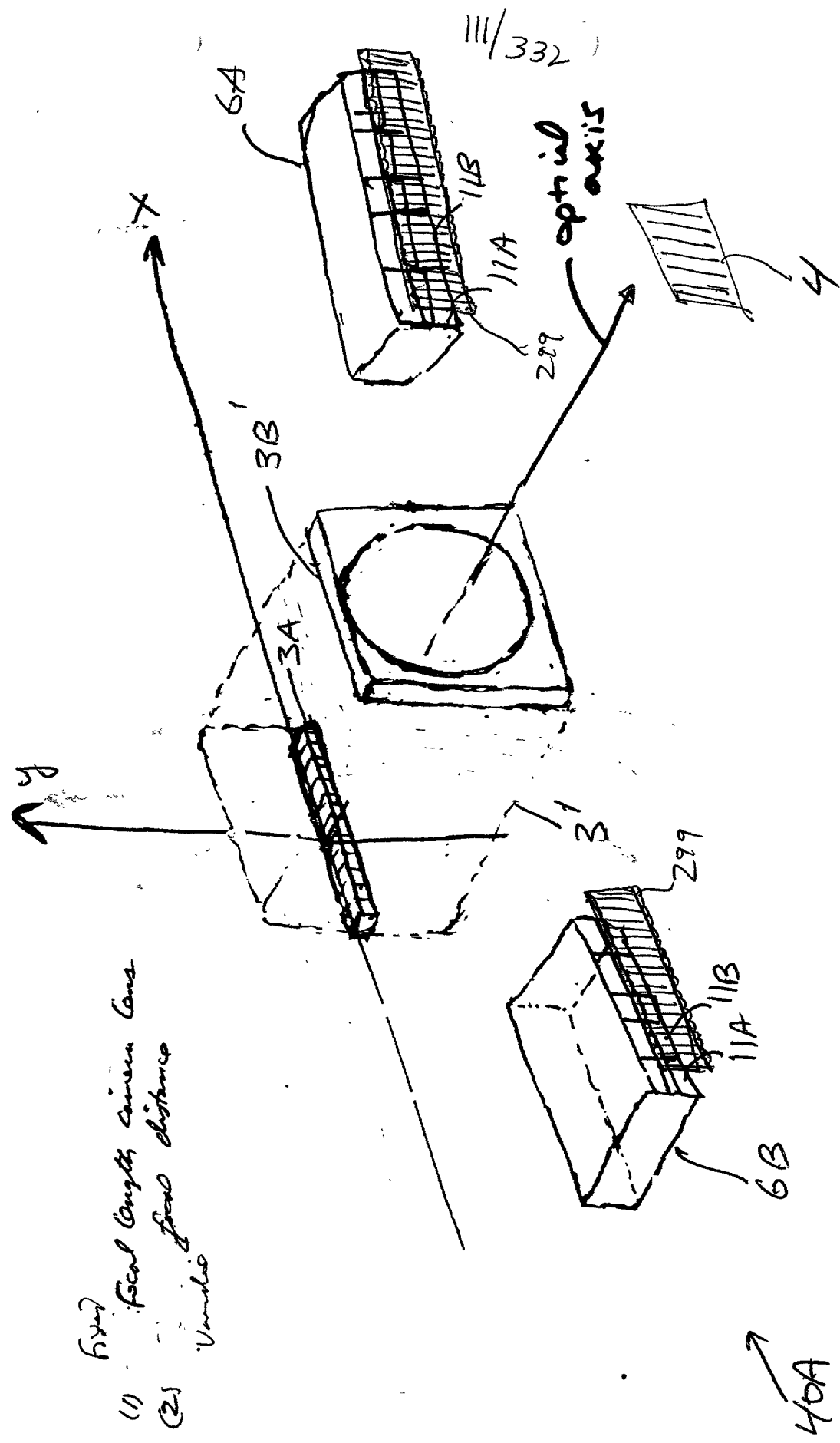


FIG. 2A

FIG. 2B2



- Fixed
- (1) focal length camera lens
 - (2) focus distance
- Variable

FIG. 2B2

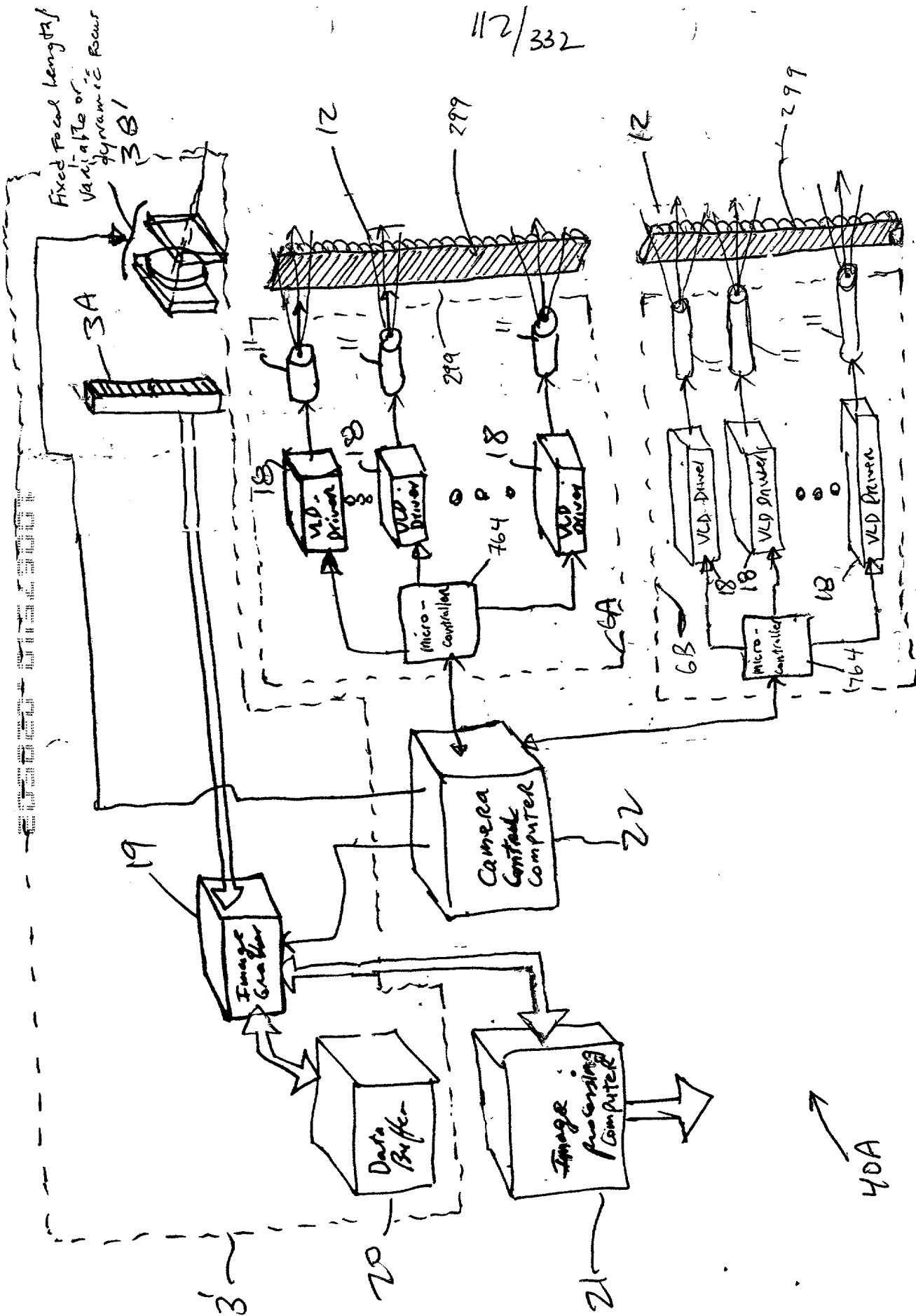


FIG. 2C1

40A

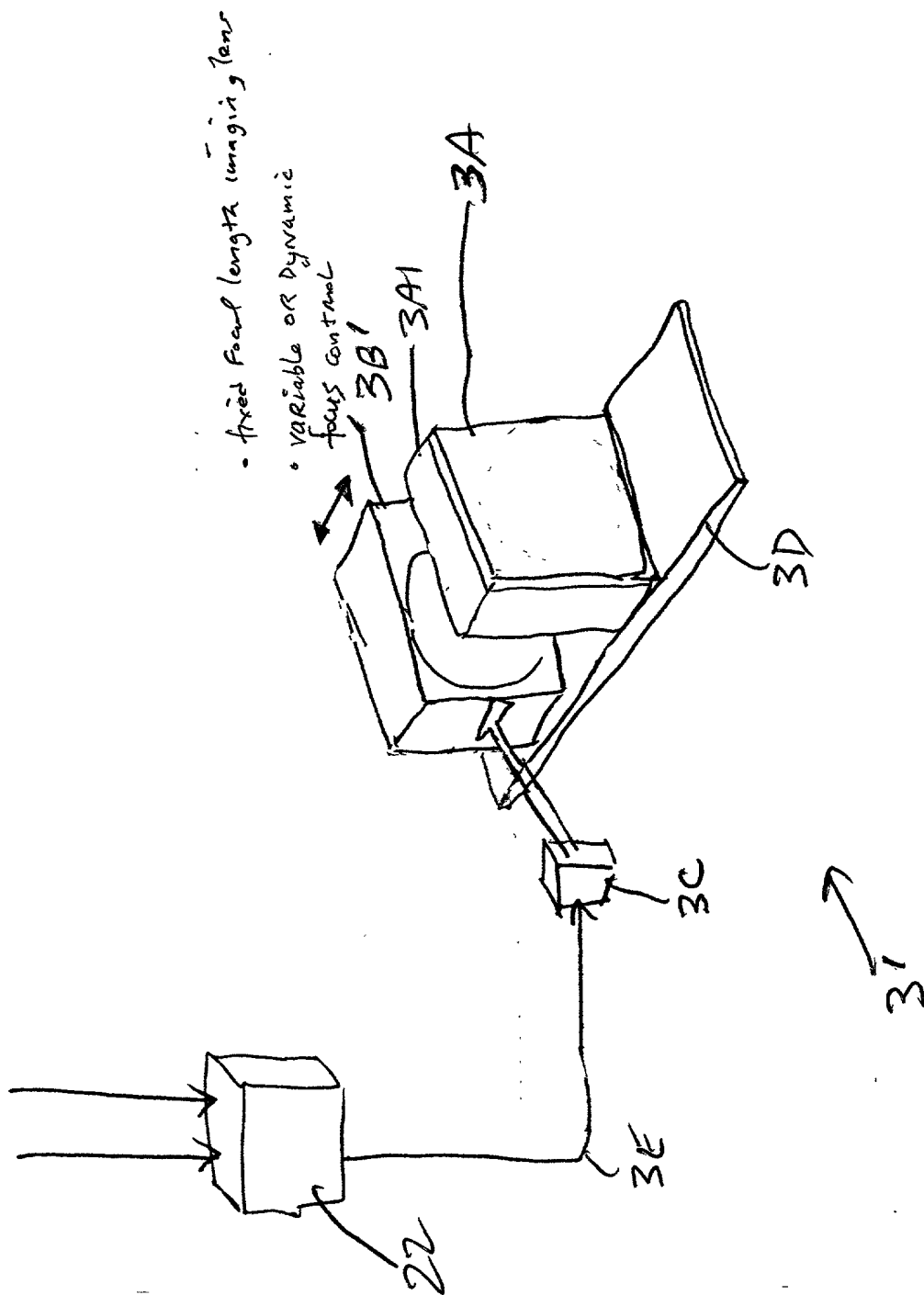


FIG. 2C2

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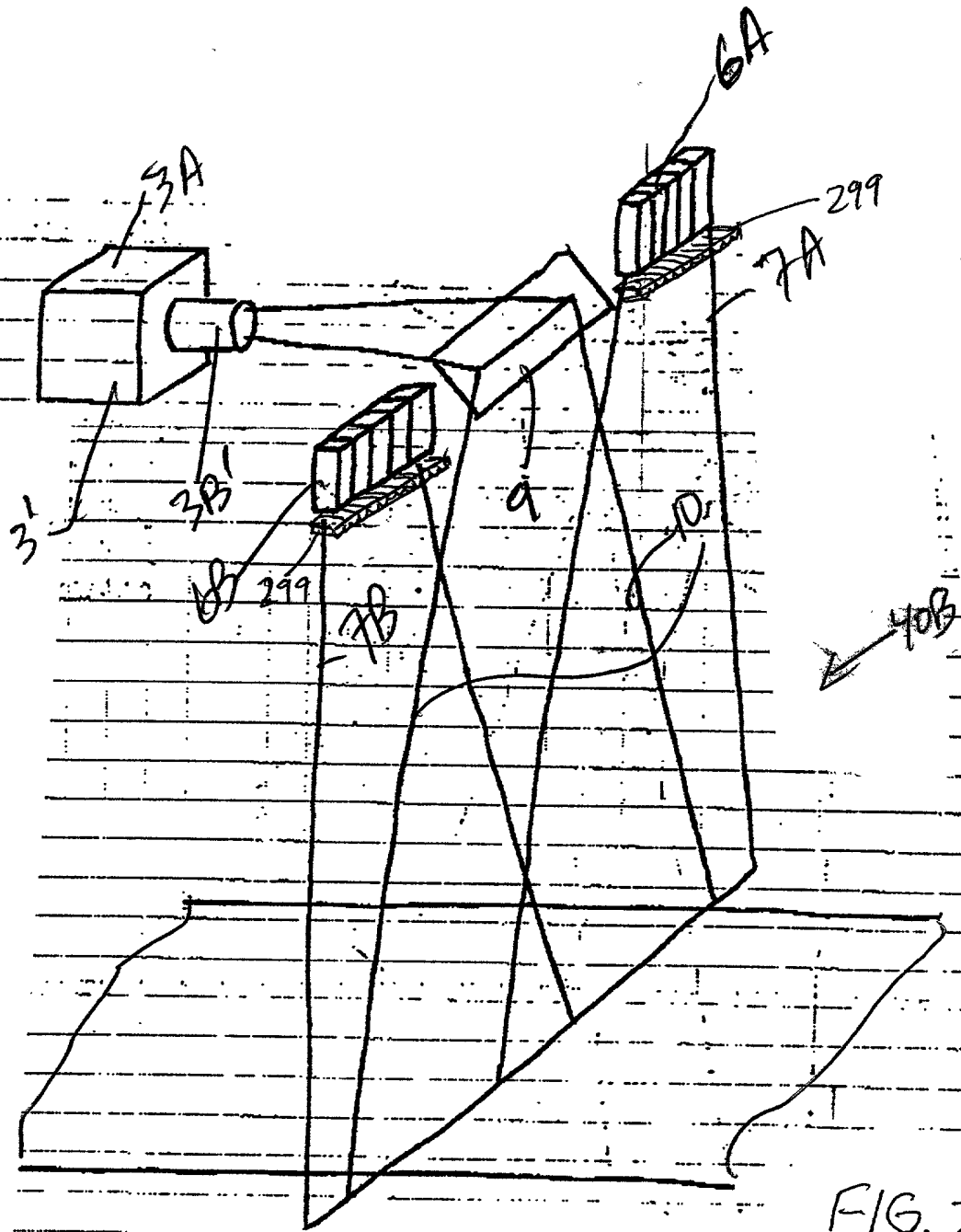


FIG. 2D1

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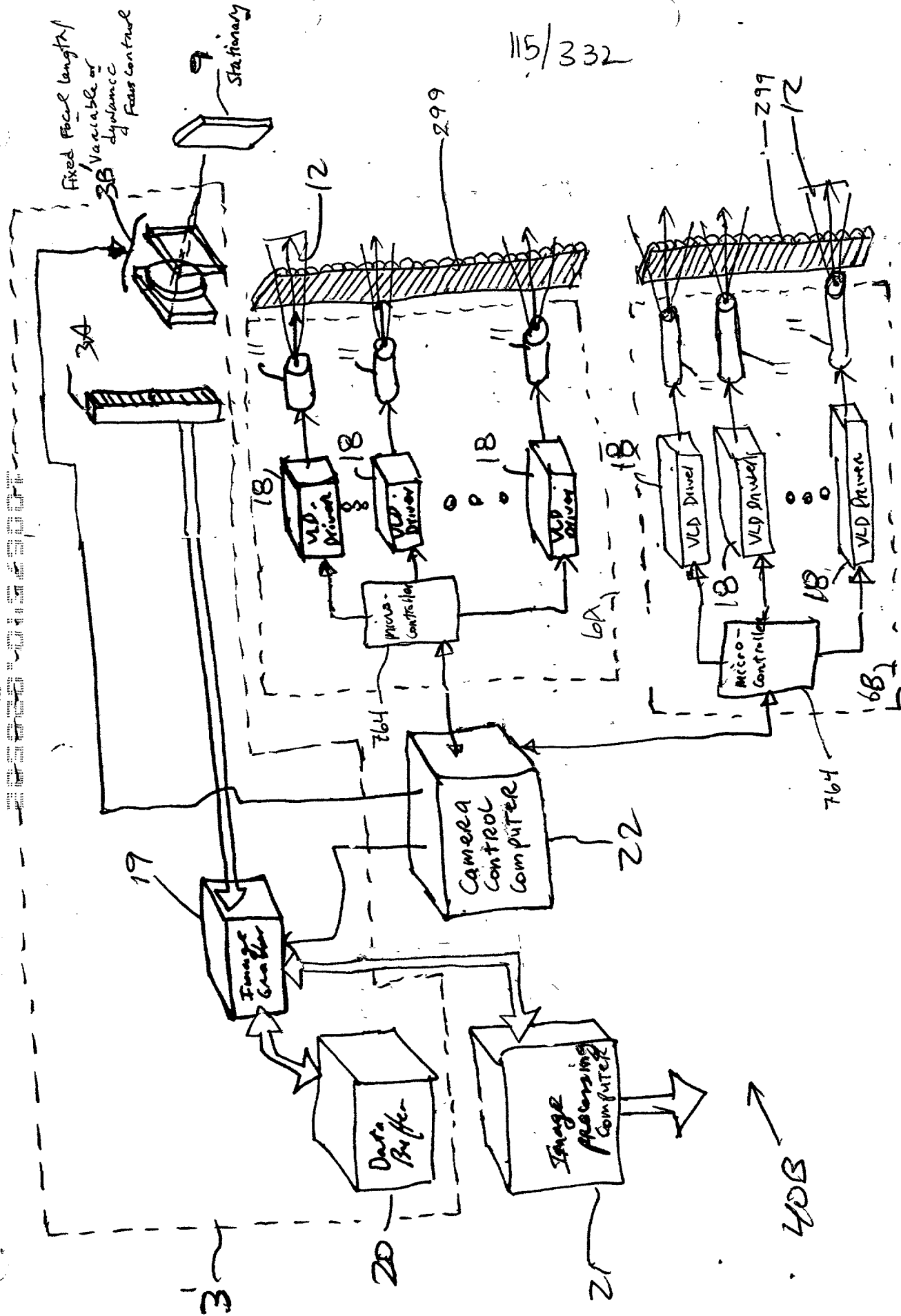


FIG. 2D2

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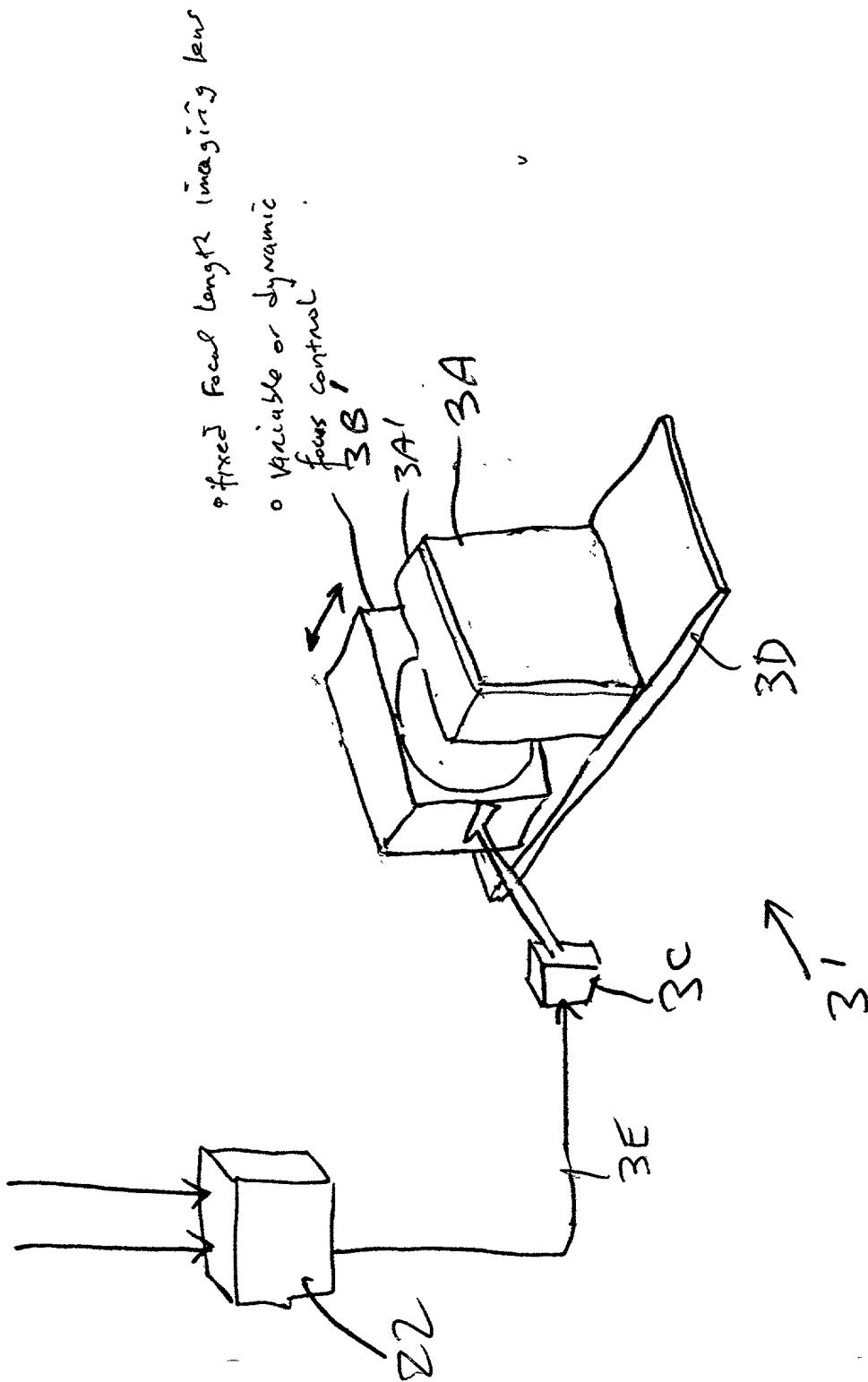


FIG. 2D3

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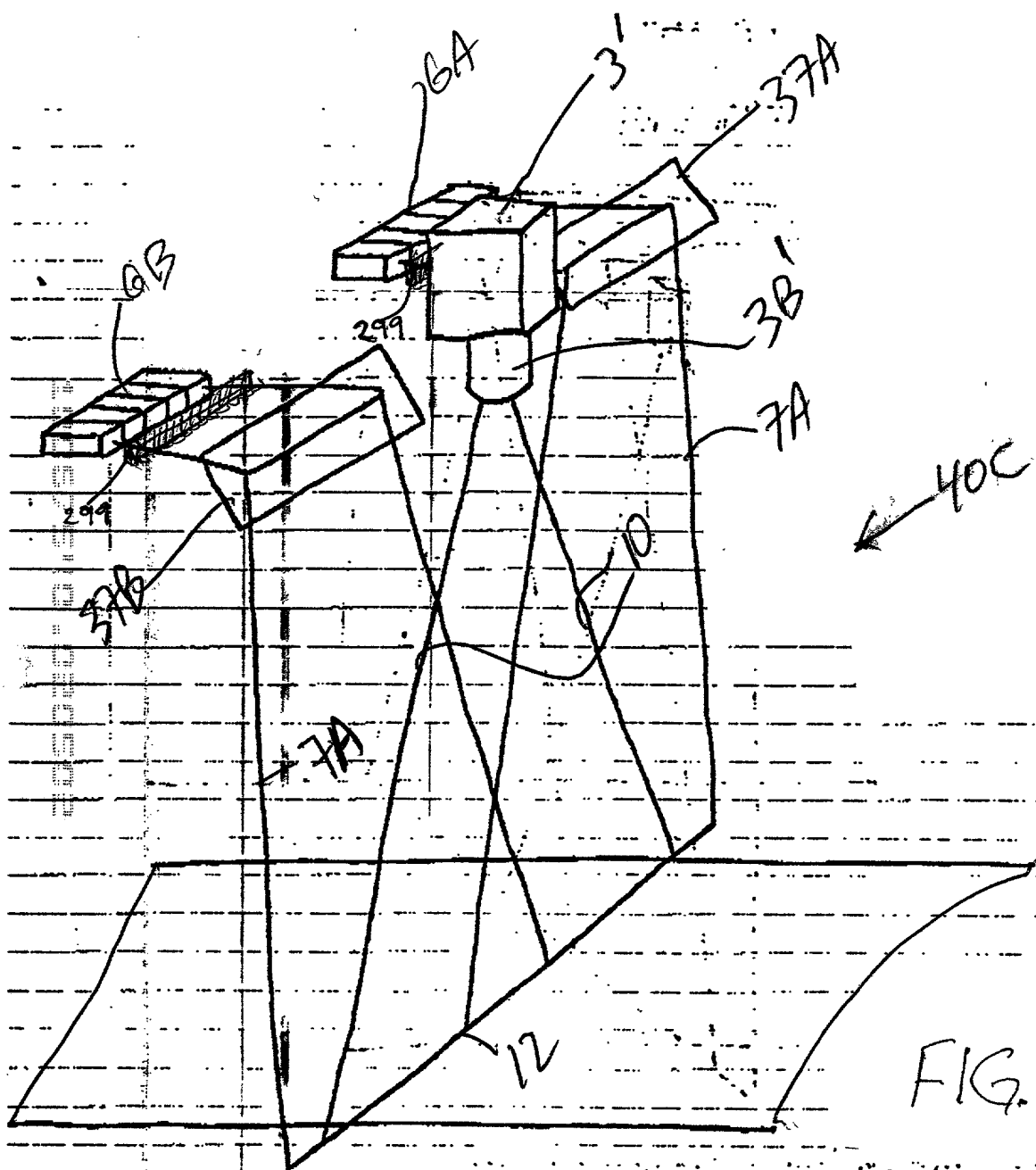


FIG. 2E1

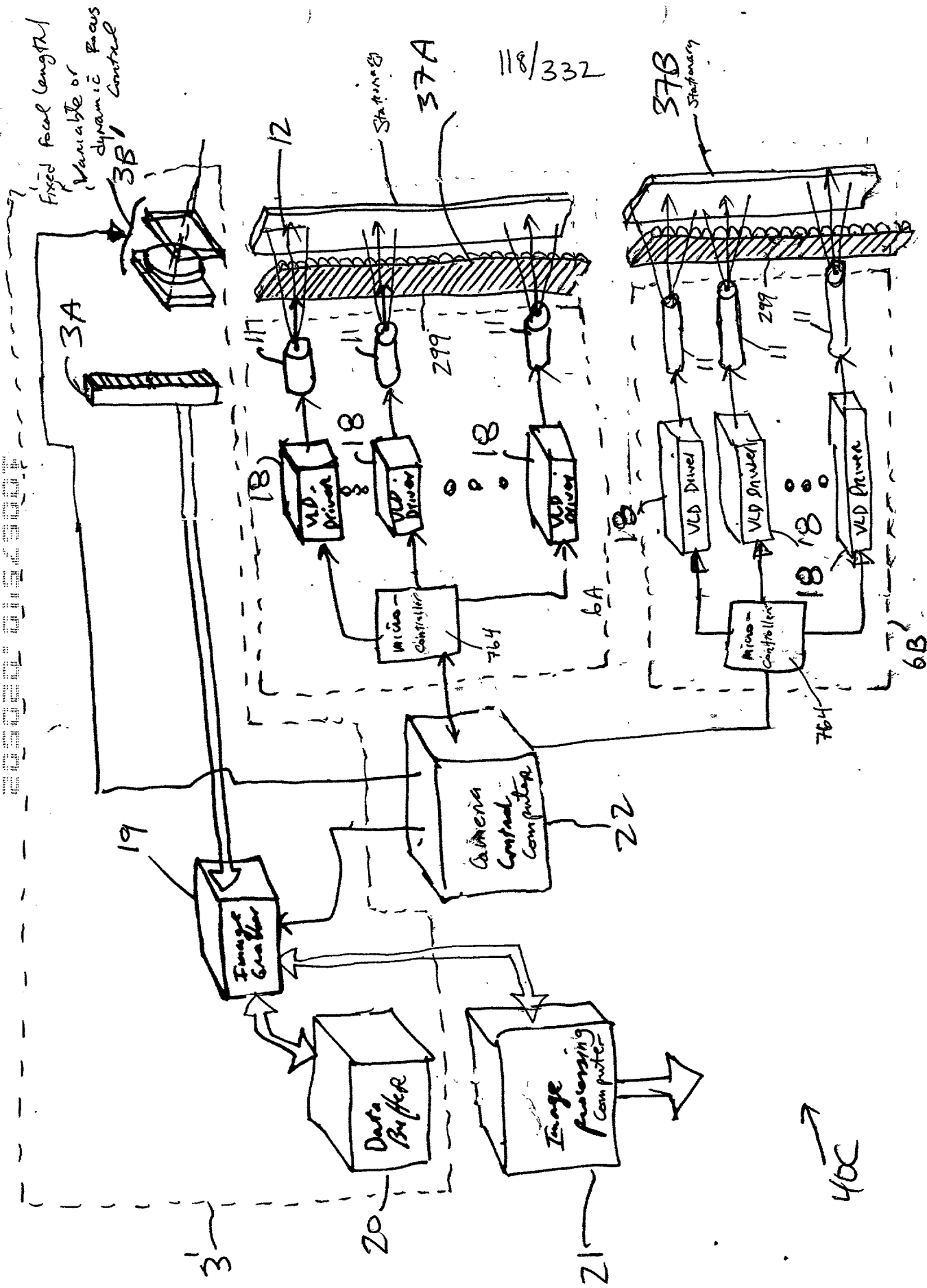


FIG. 2E2

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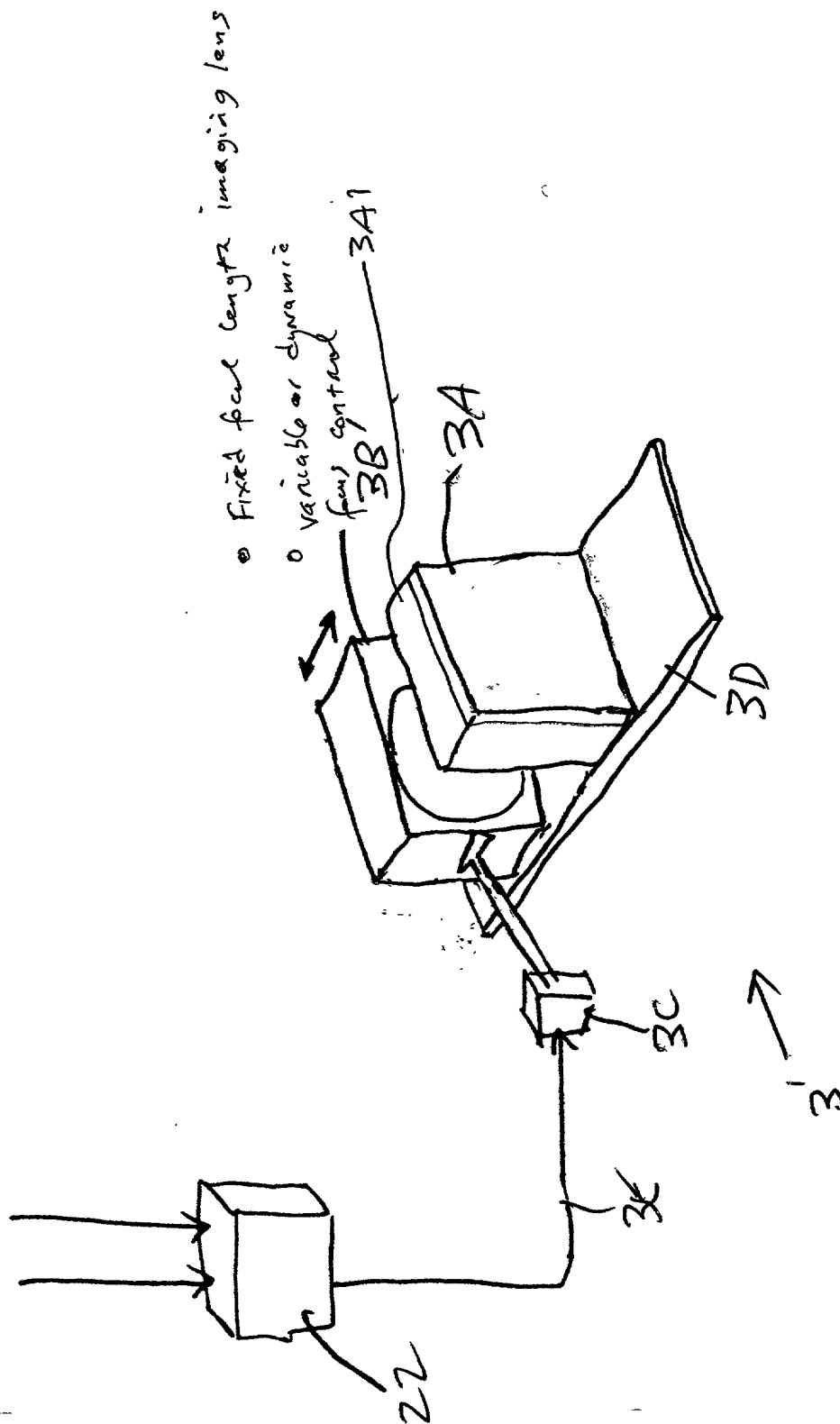


FIG. 2E3

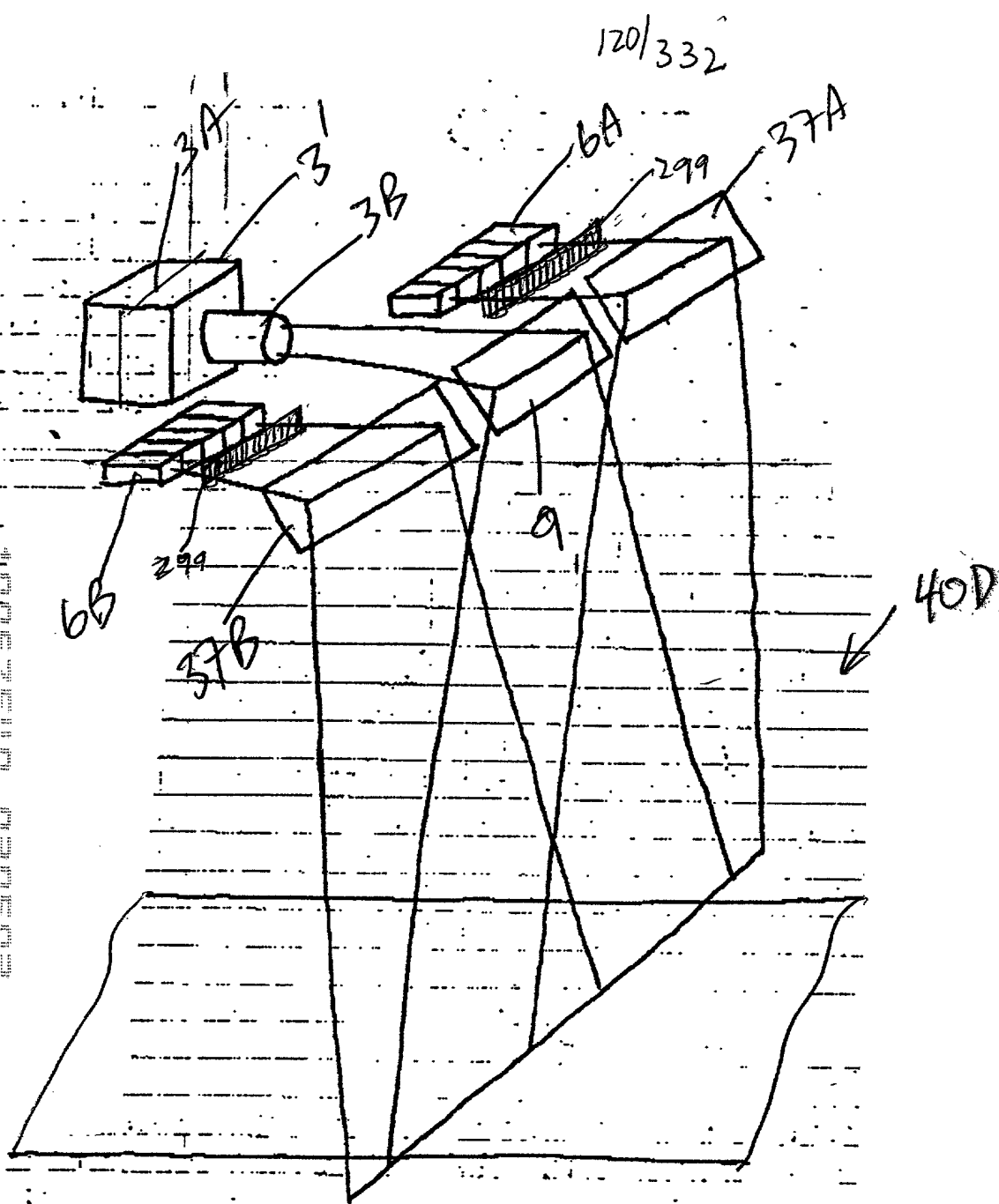


FIG. 2F1

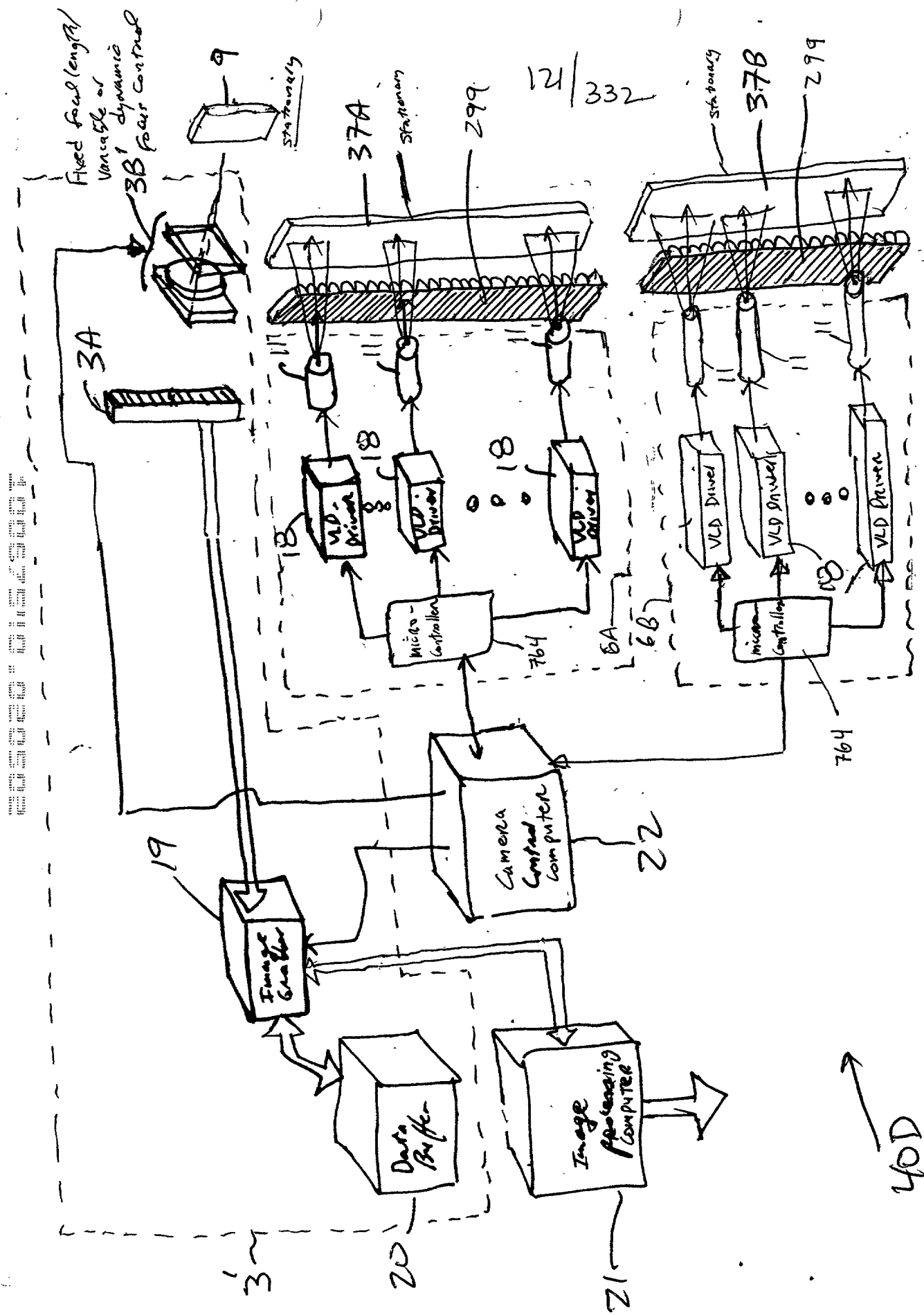


FIG 2F2

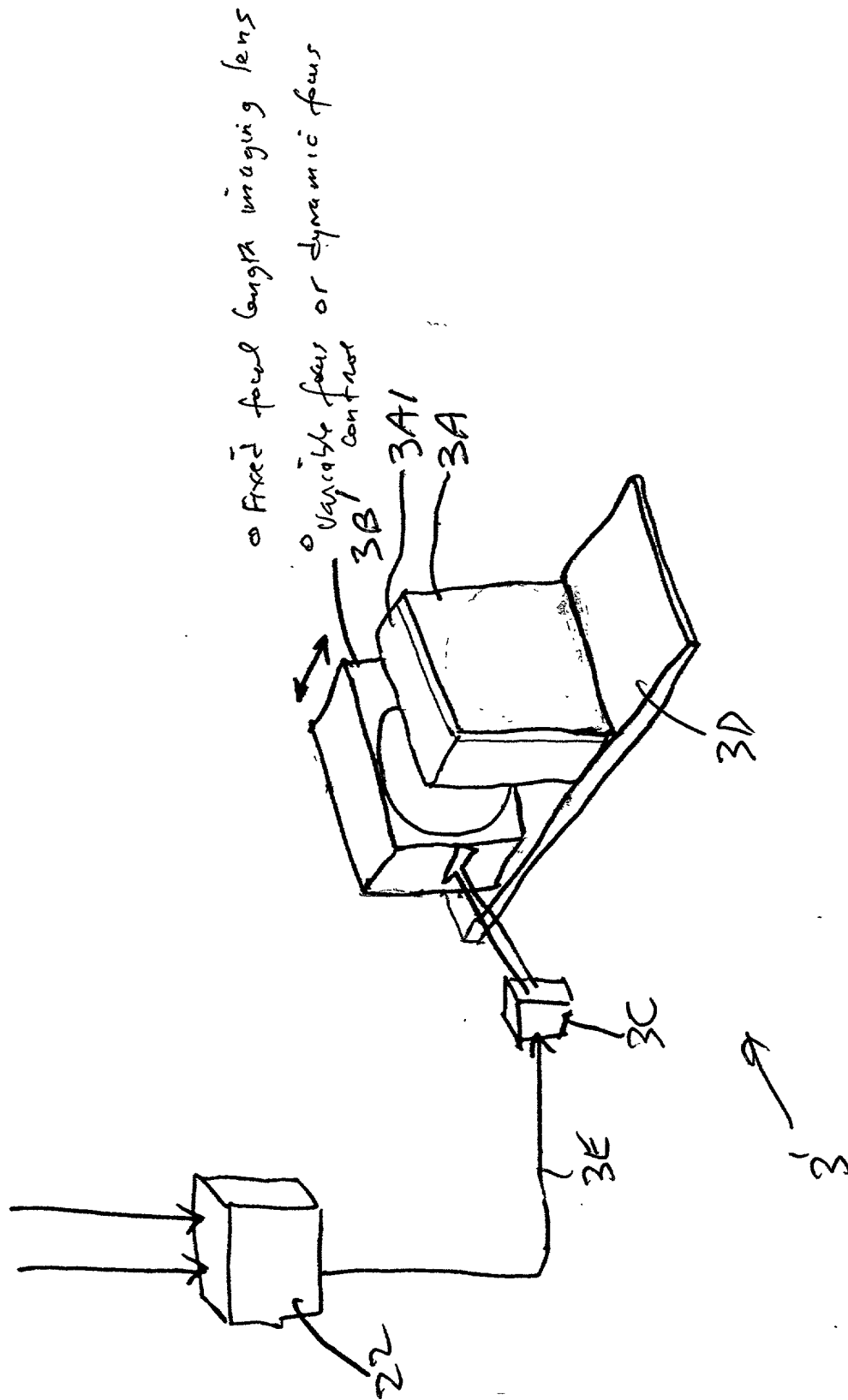


FIG. 2F3

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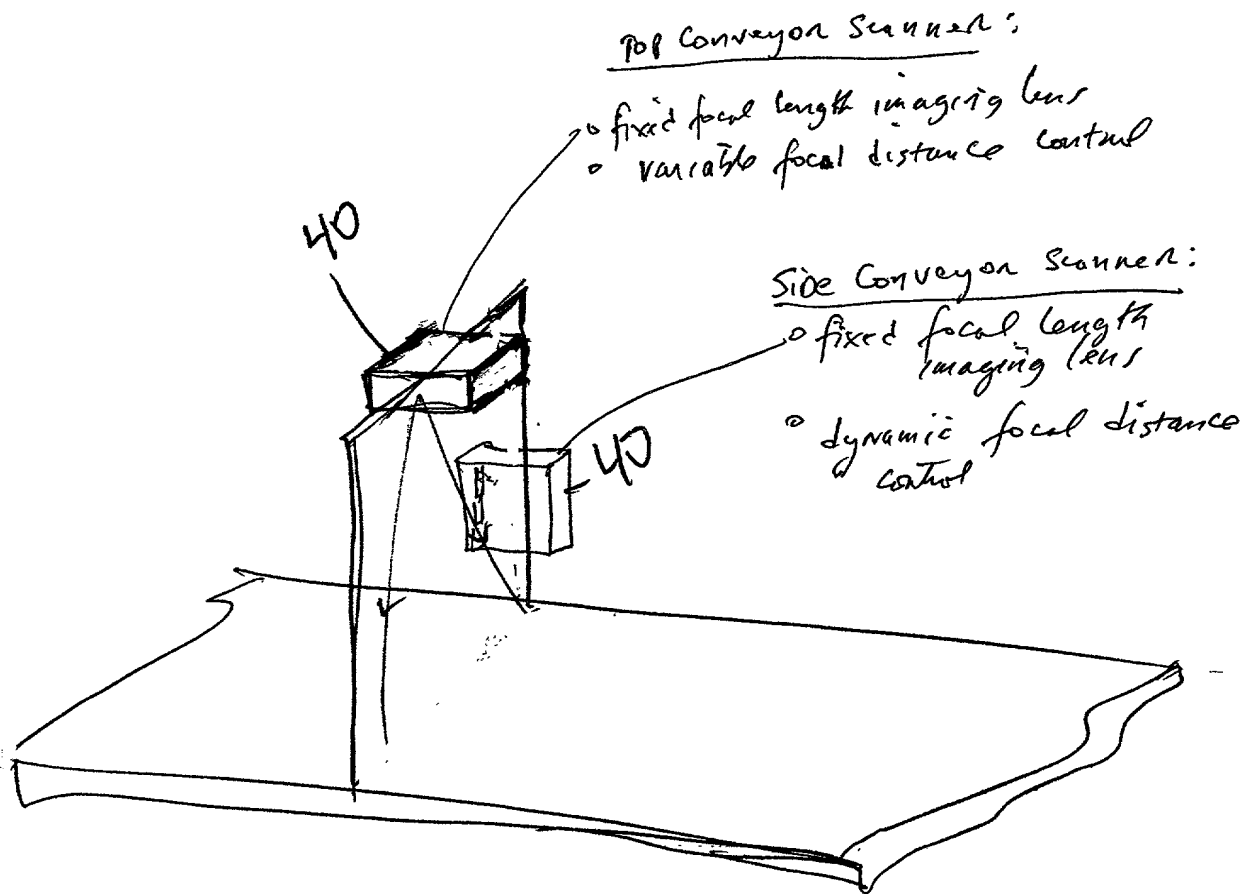
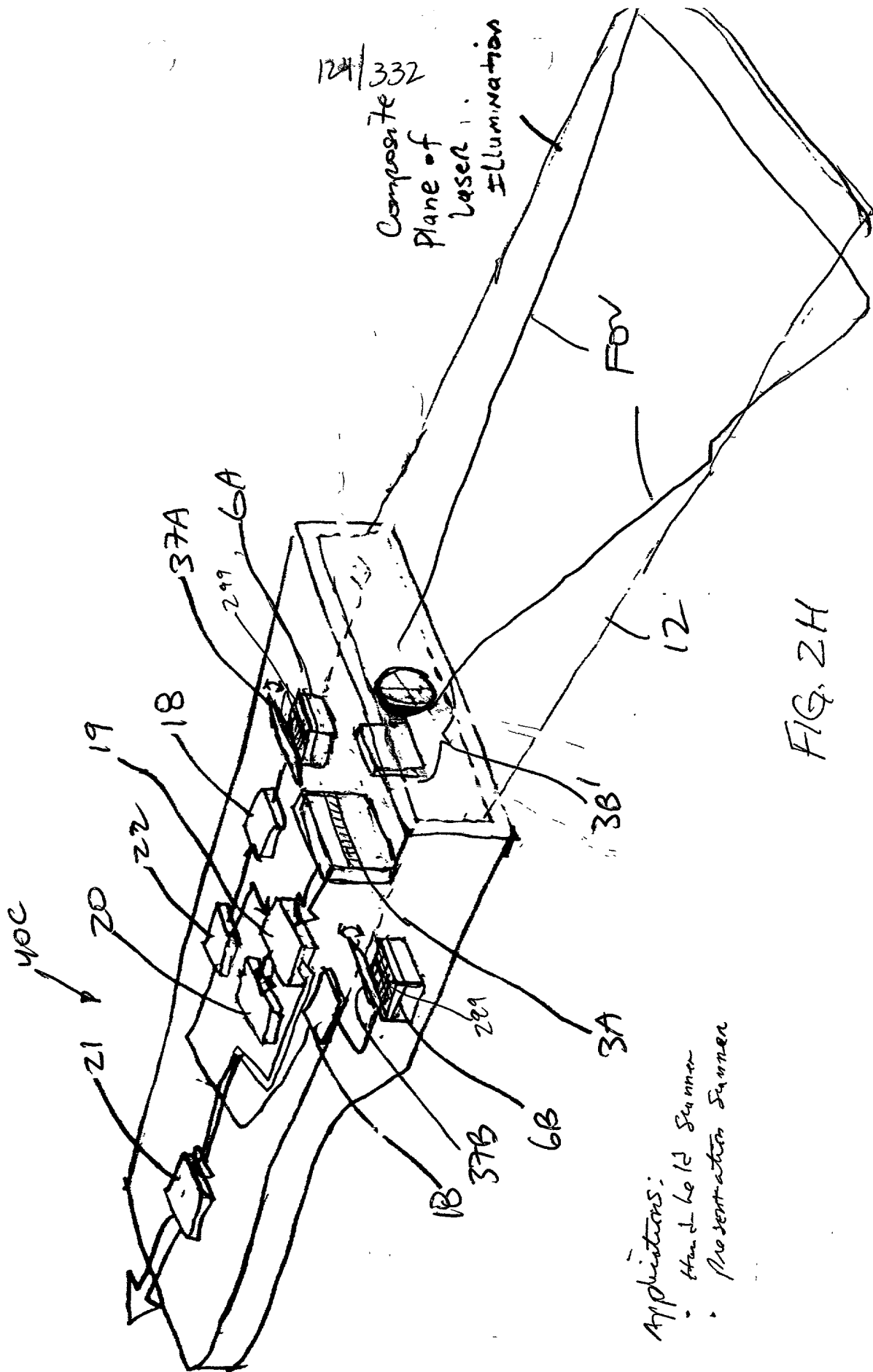


FIG. 2G



Applications:

- handheld scanner
- presentation scanner

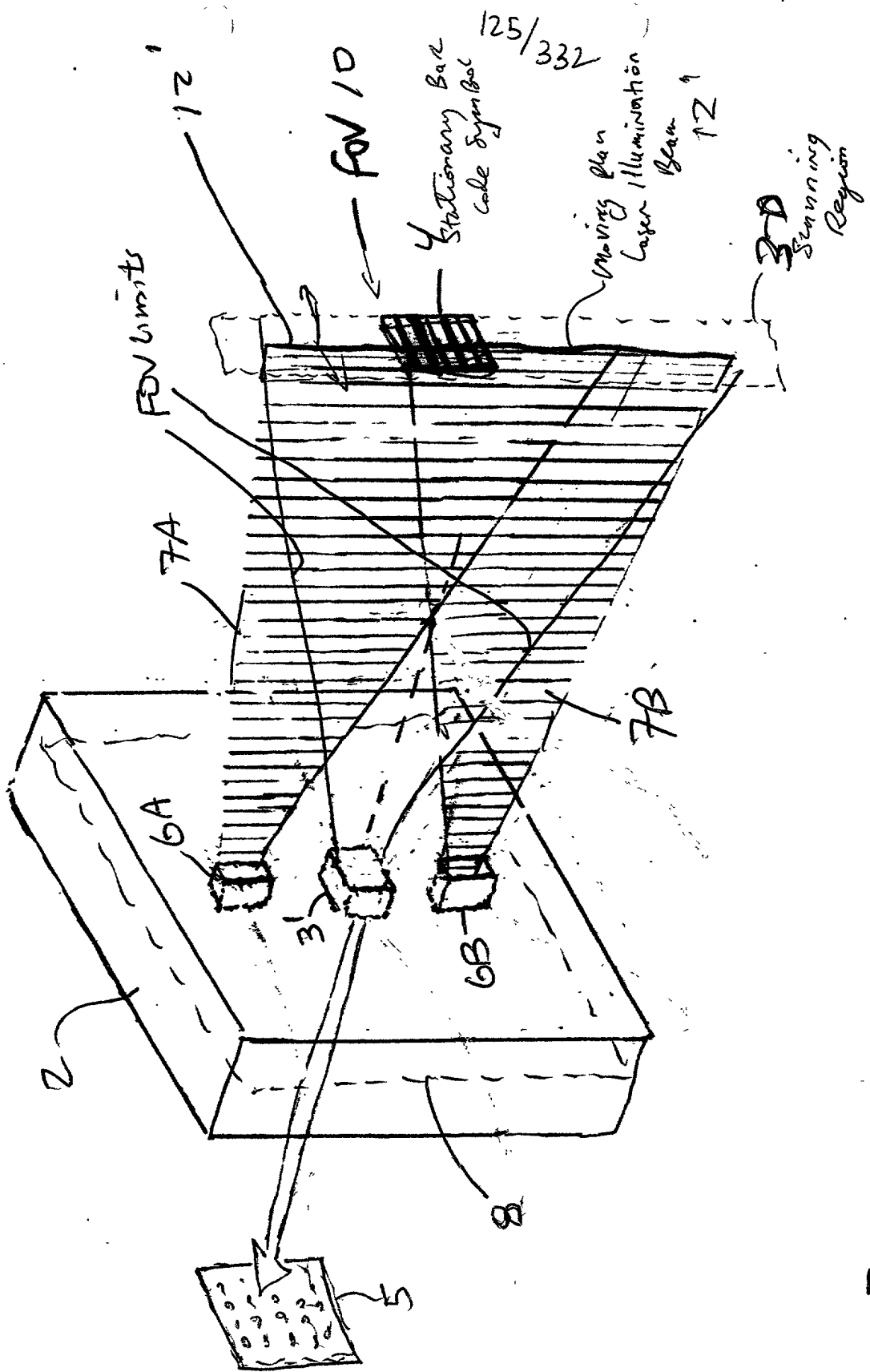
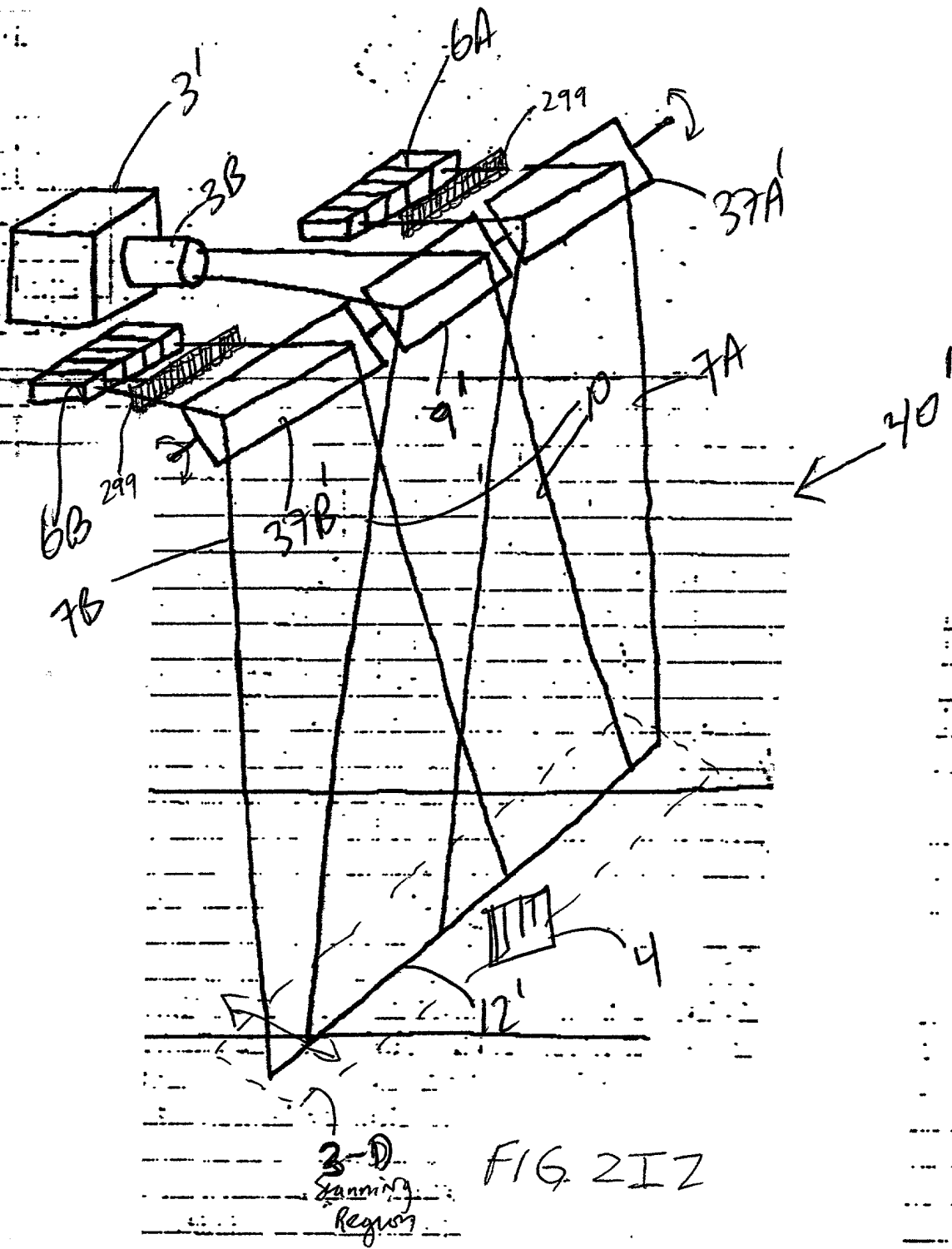


FIG. 2II



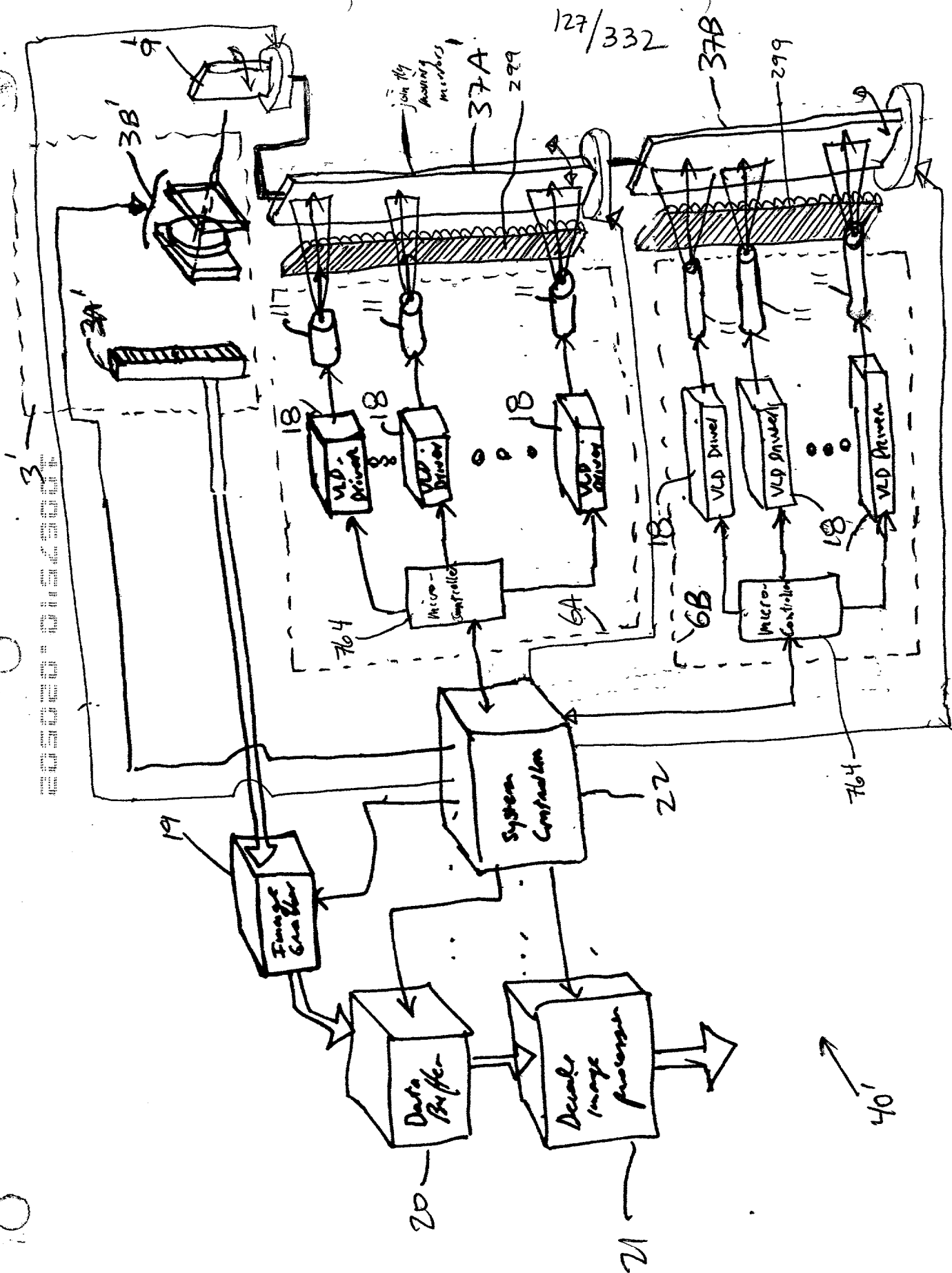


FIG. 213

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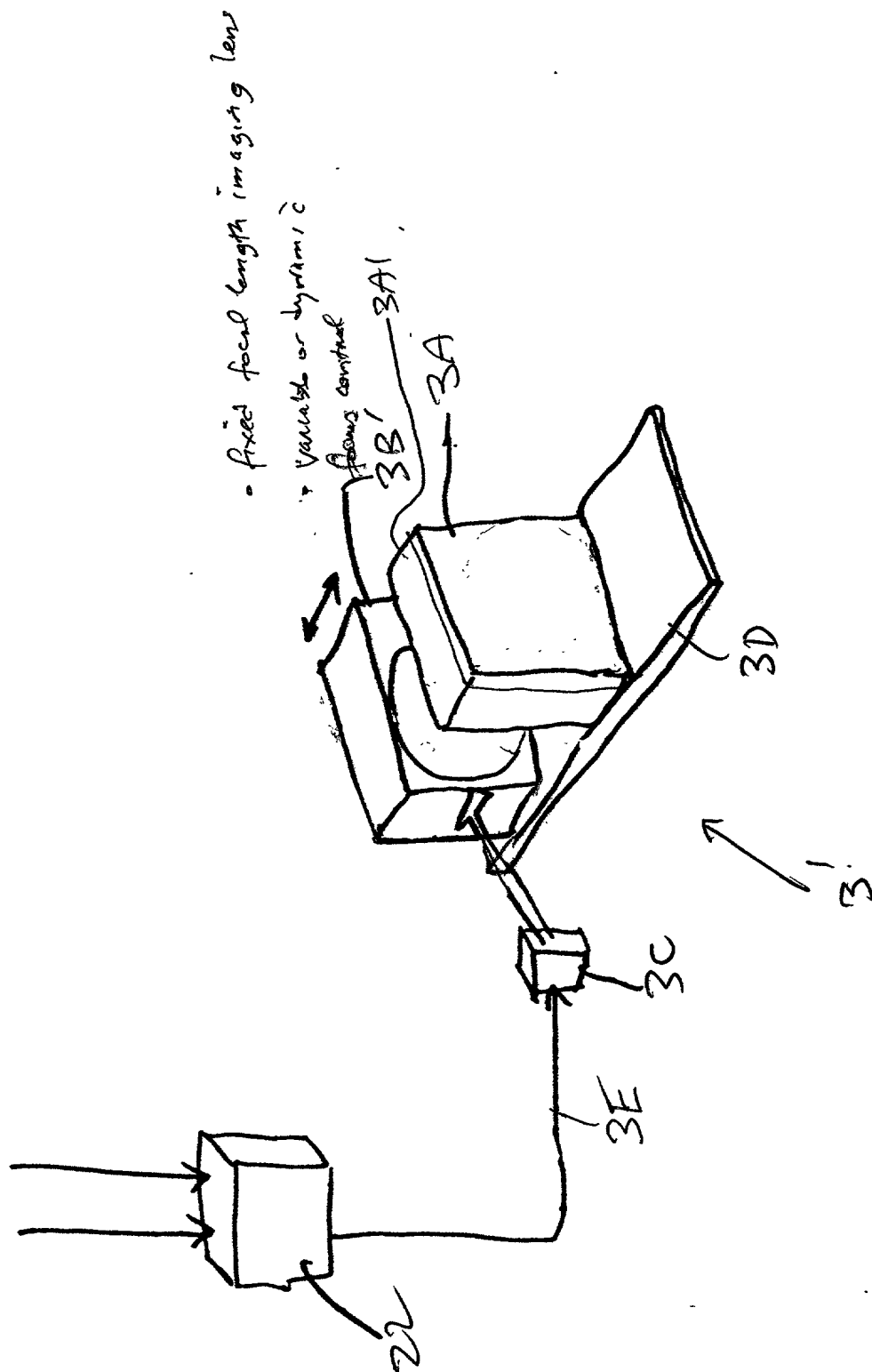
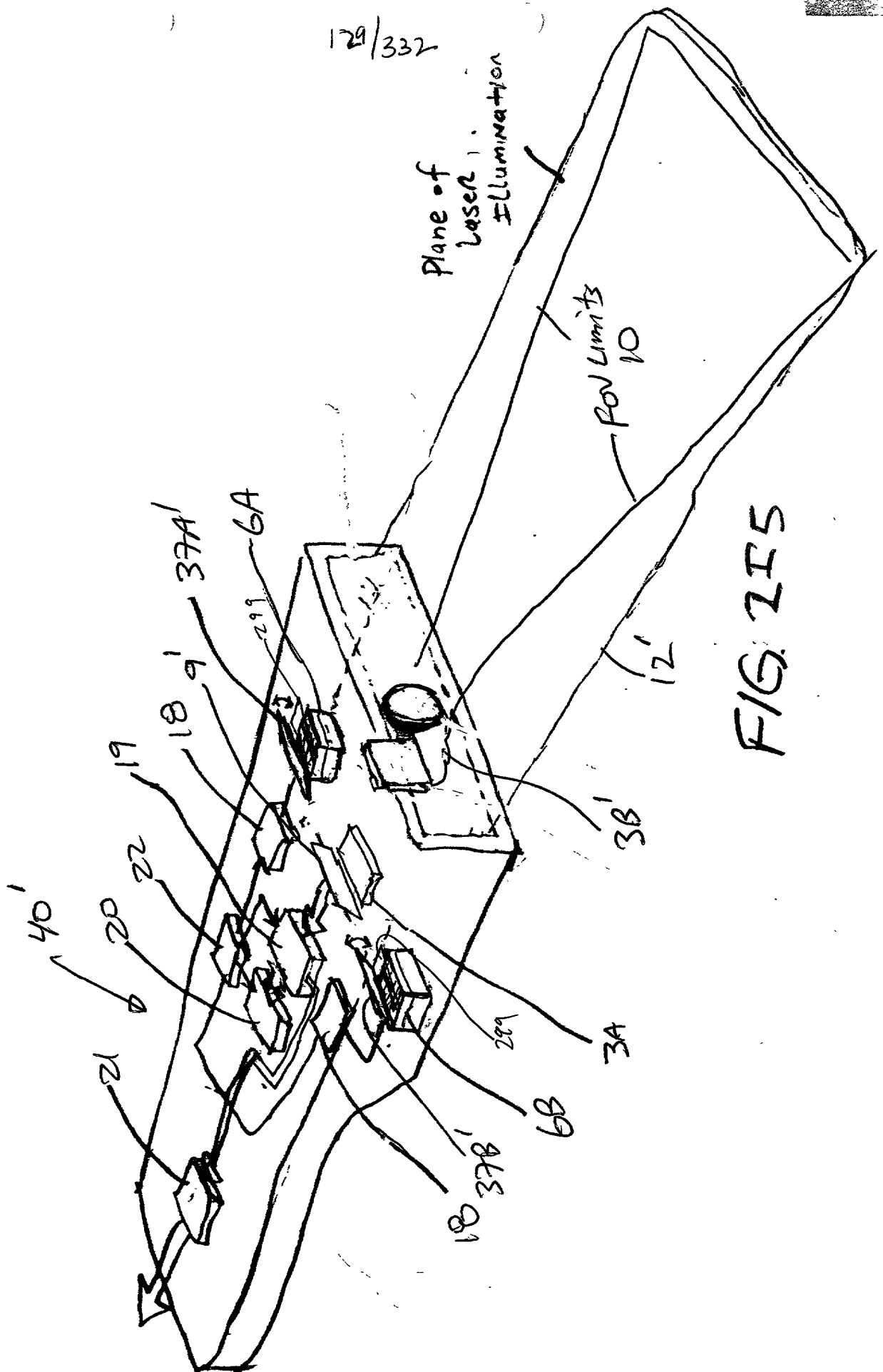


FIG. 2I4

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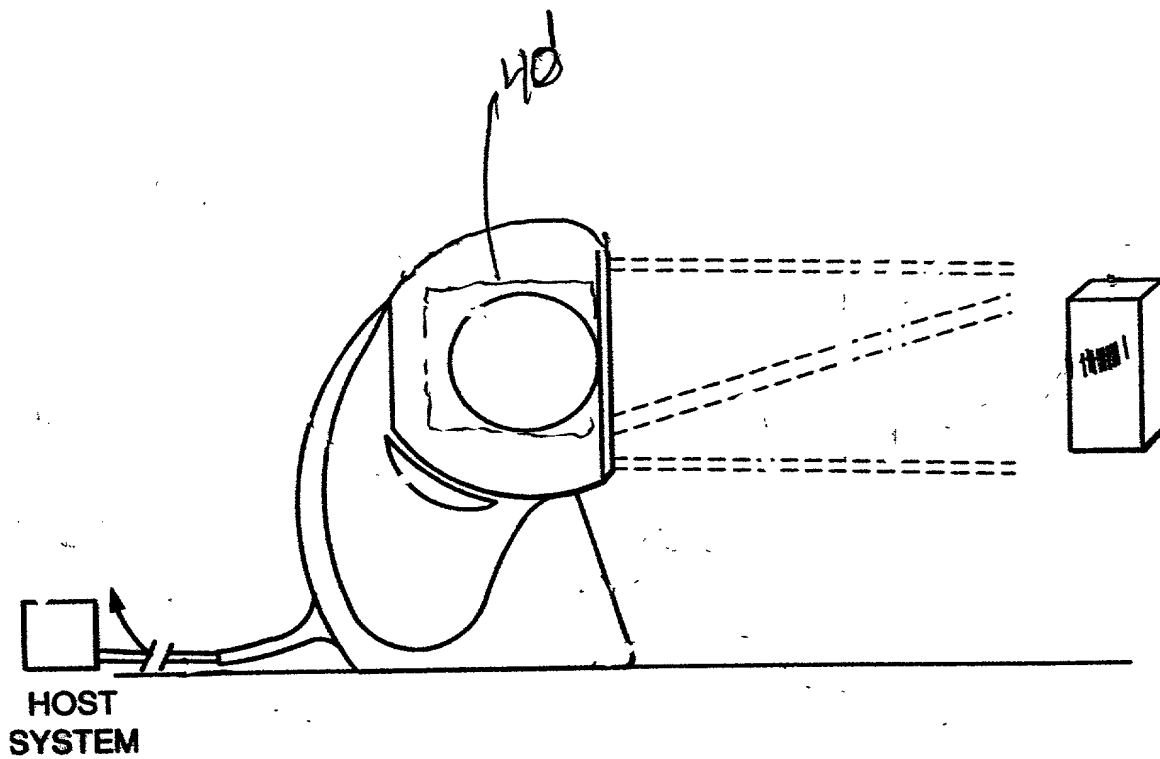
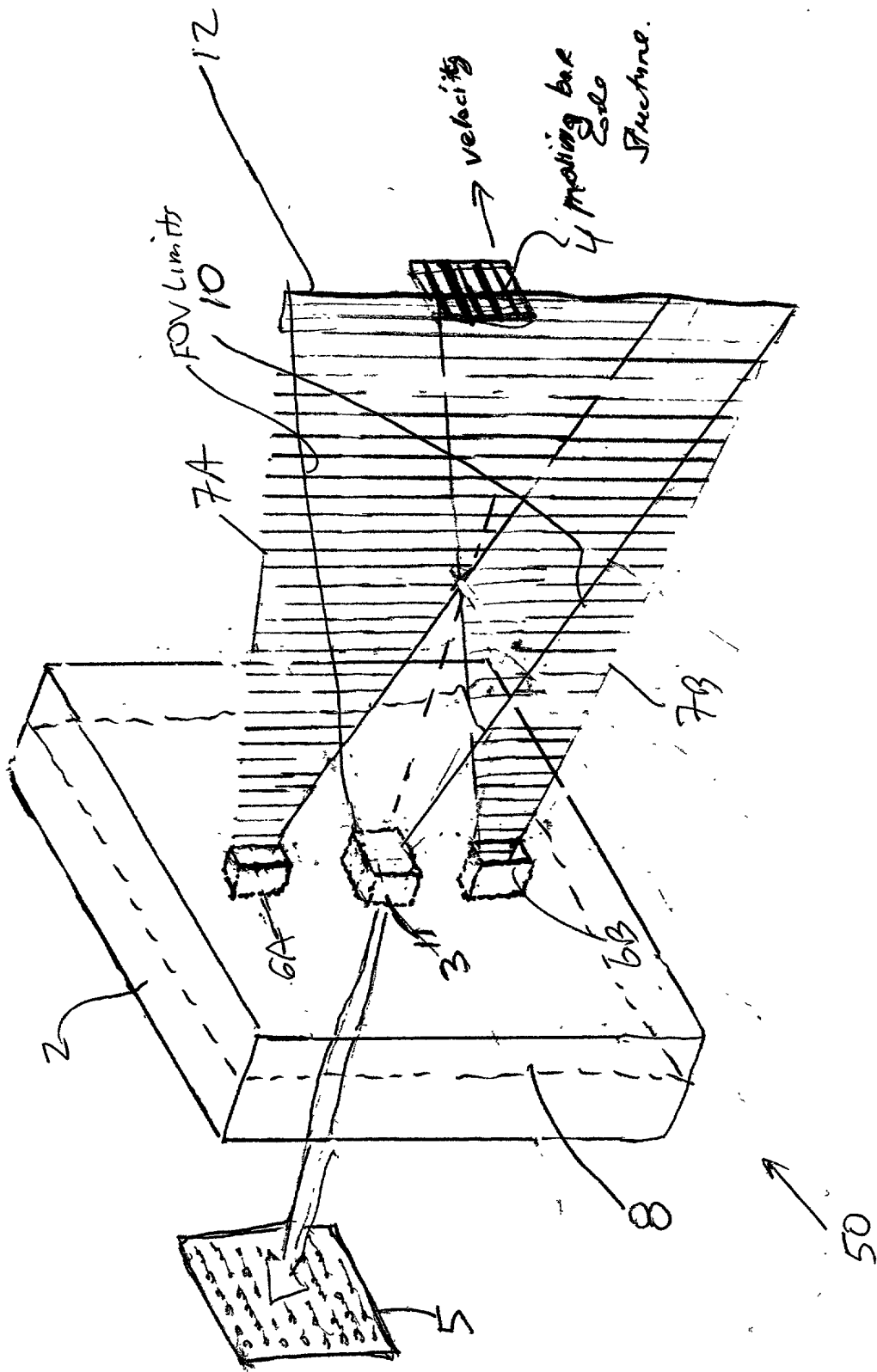


FIG. 2I6



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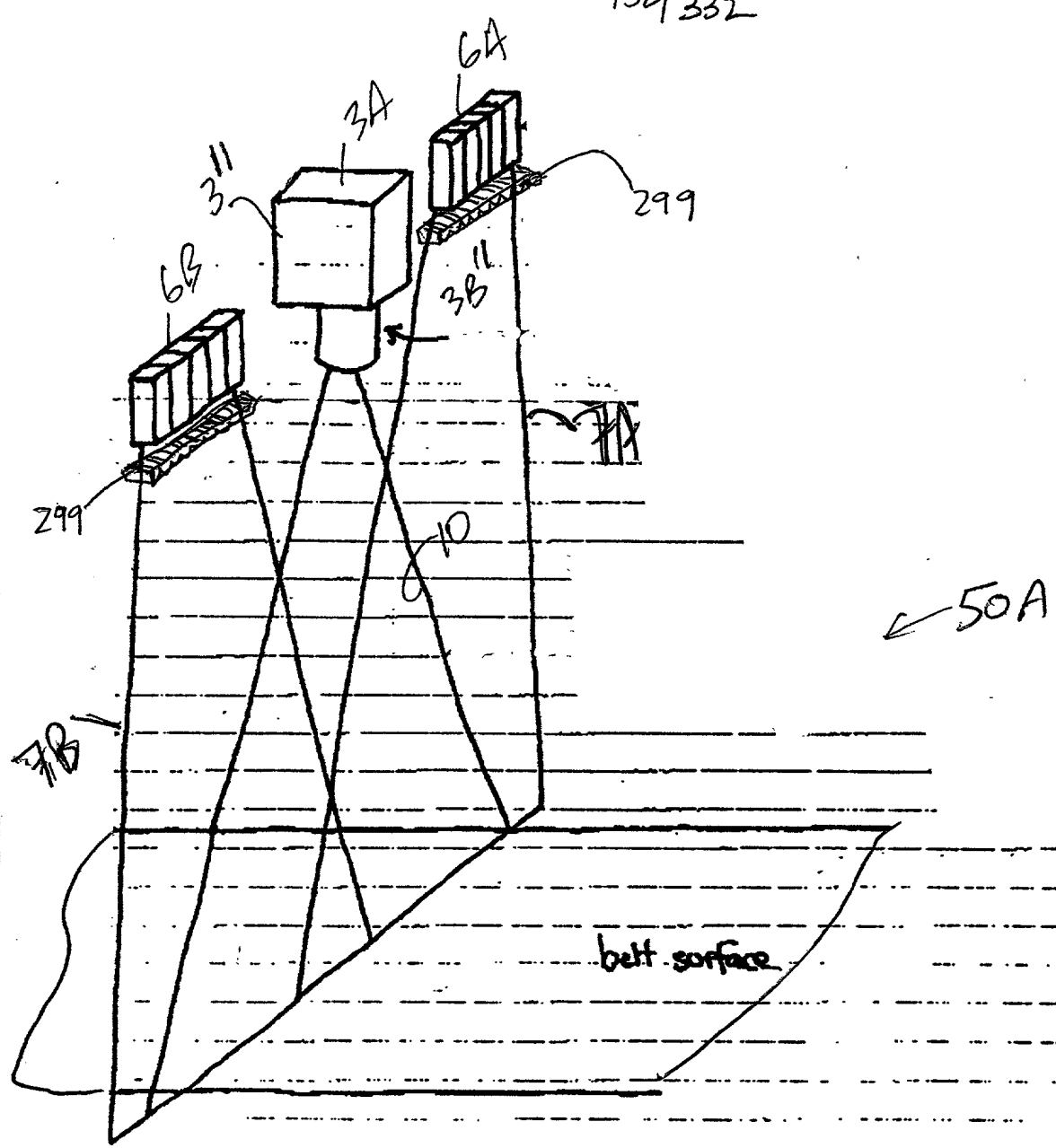
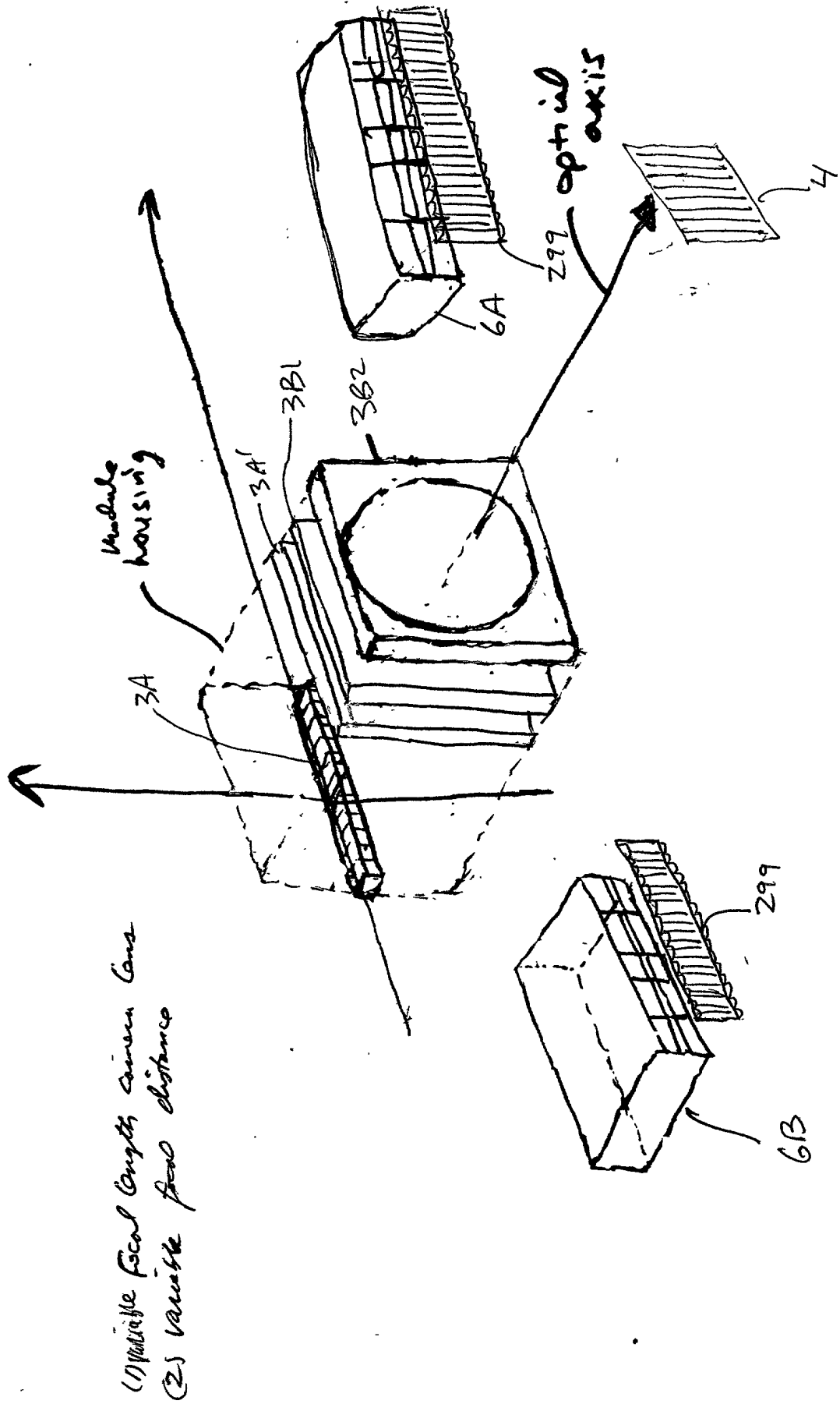


FIG. 3B1

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- Variable focal length camera lens

- variable focal distance

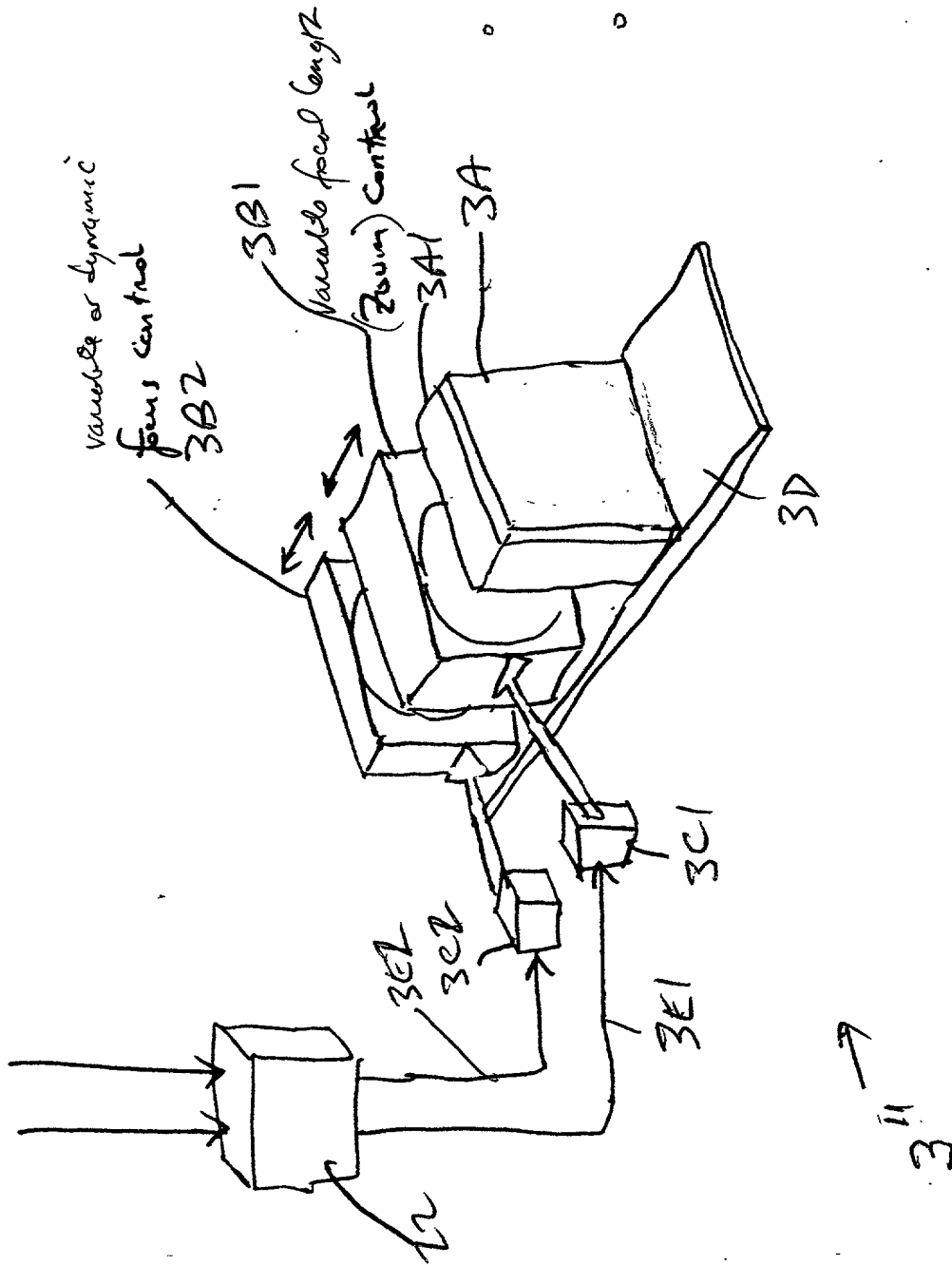
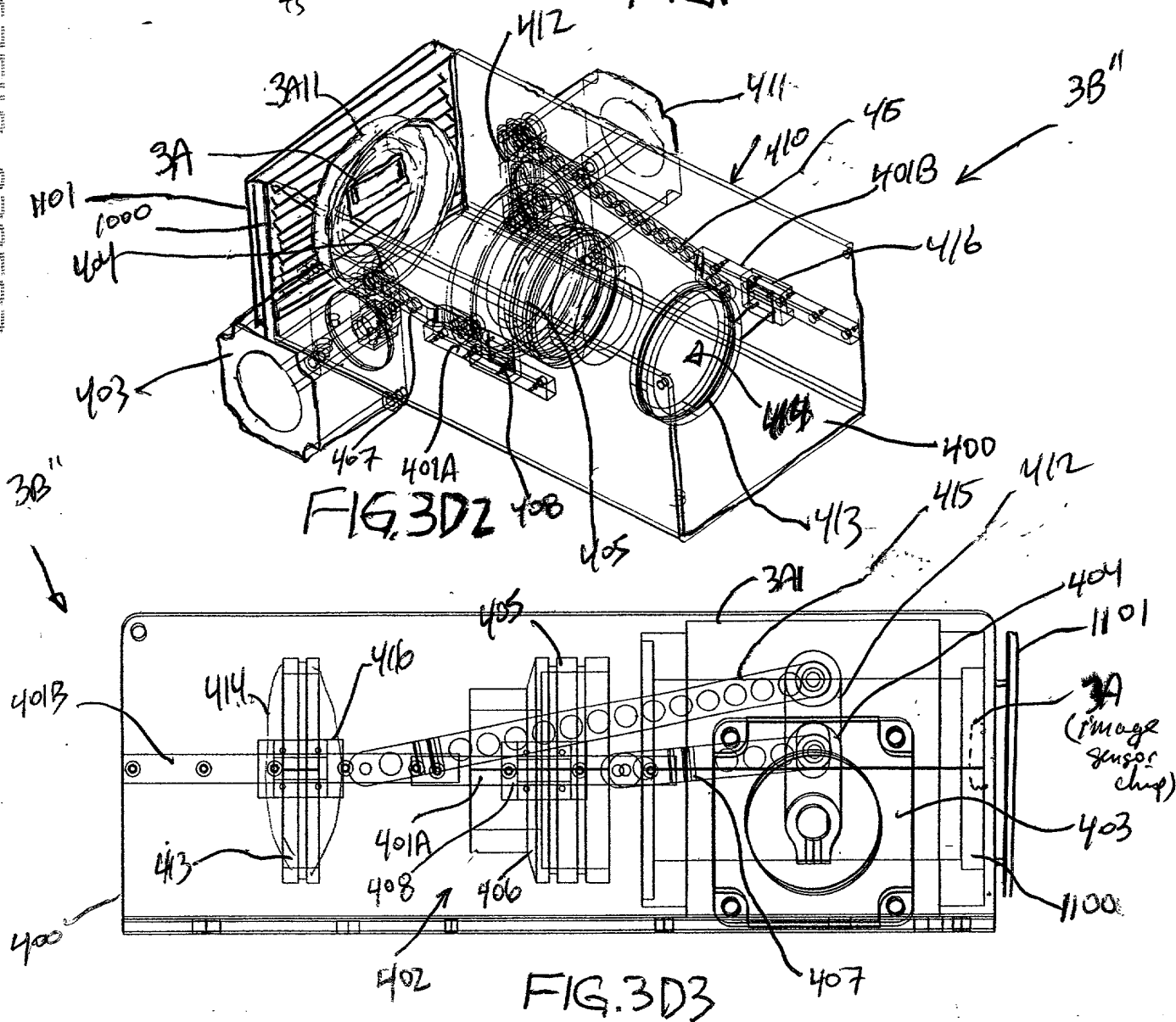
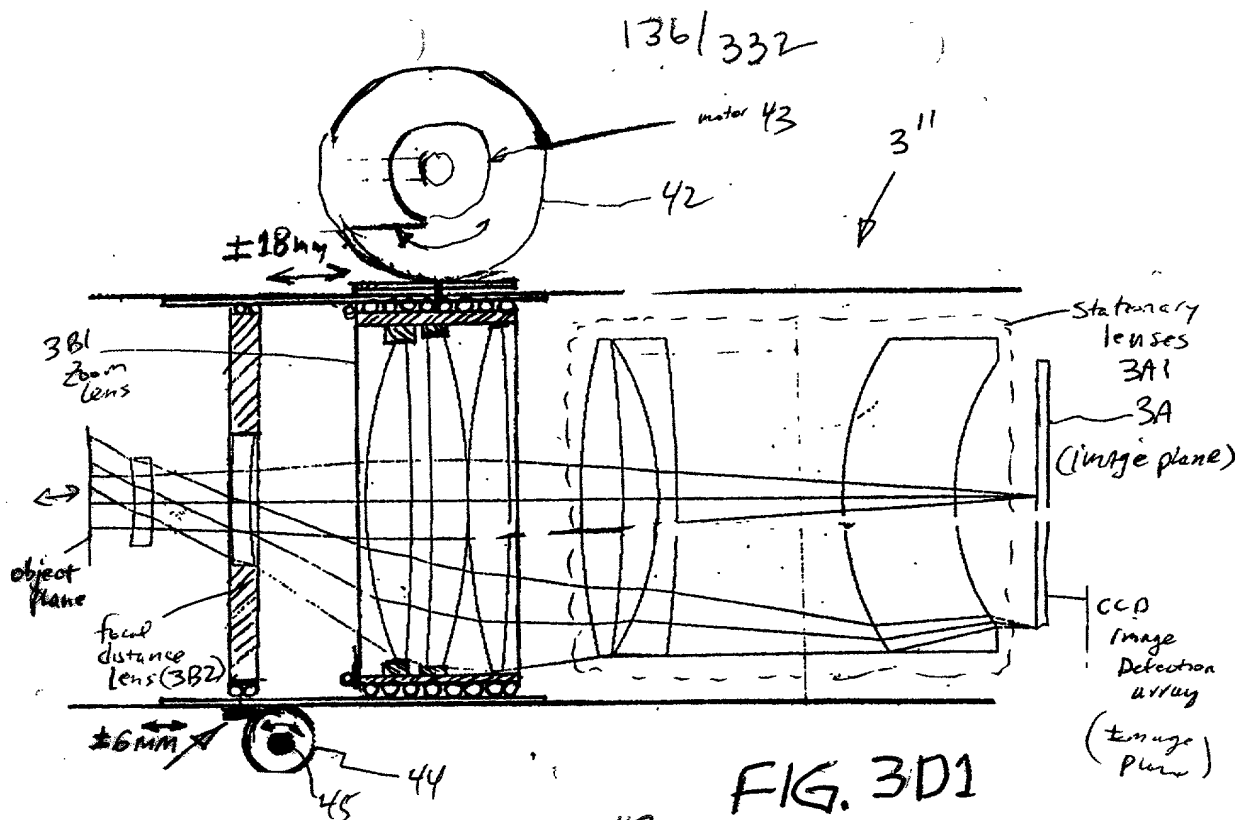


FIG. 3CZ



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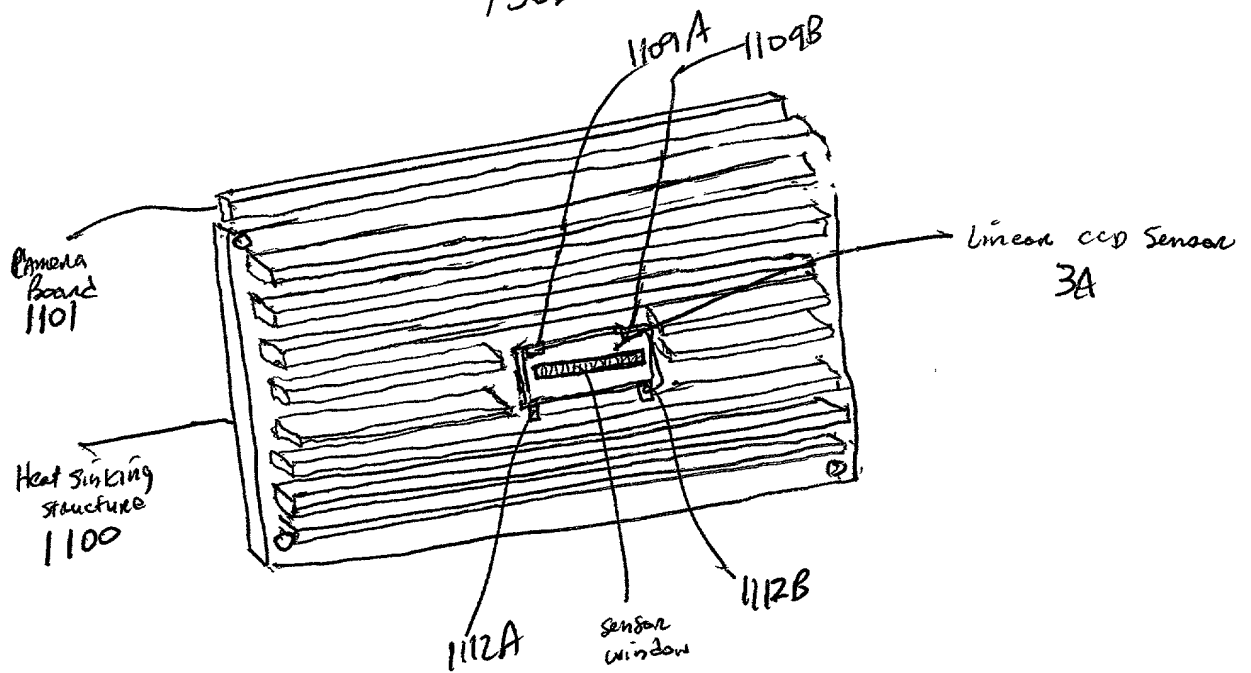


FIG. 3D4

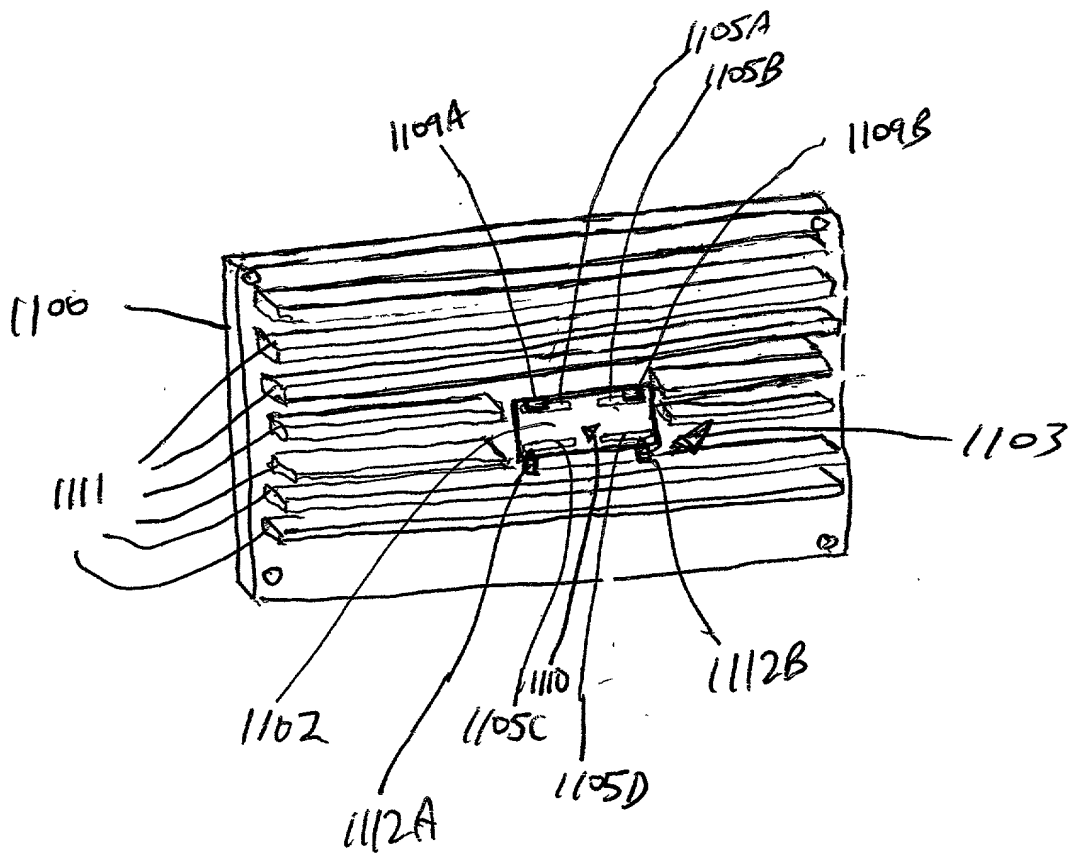
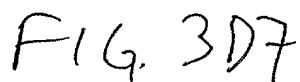
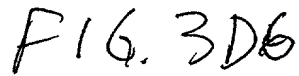
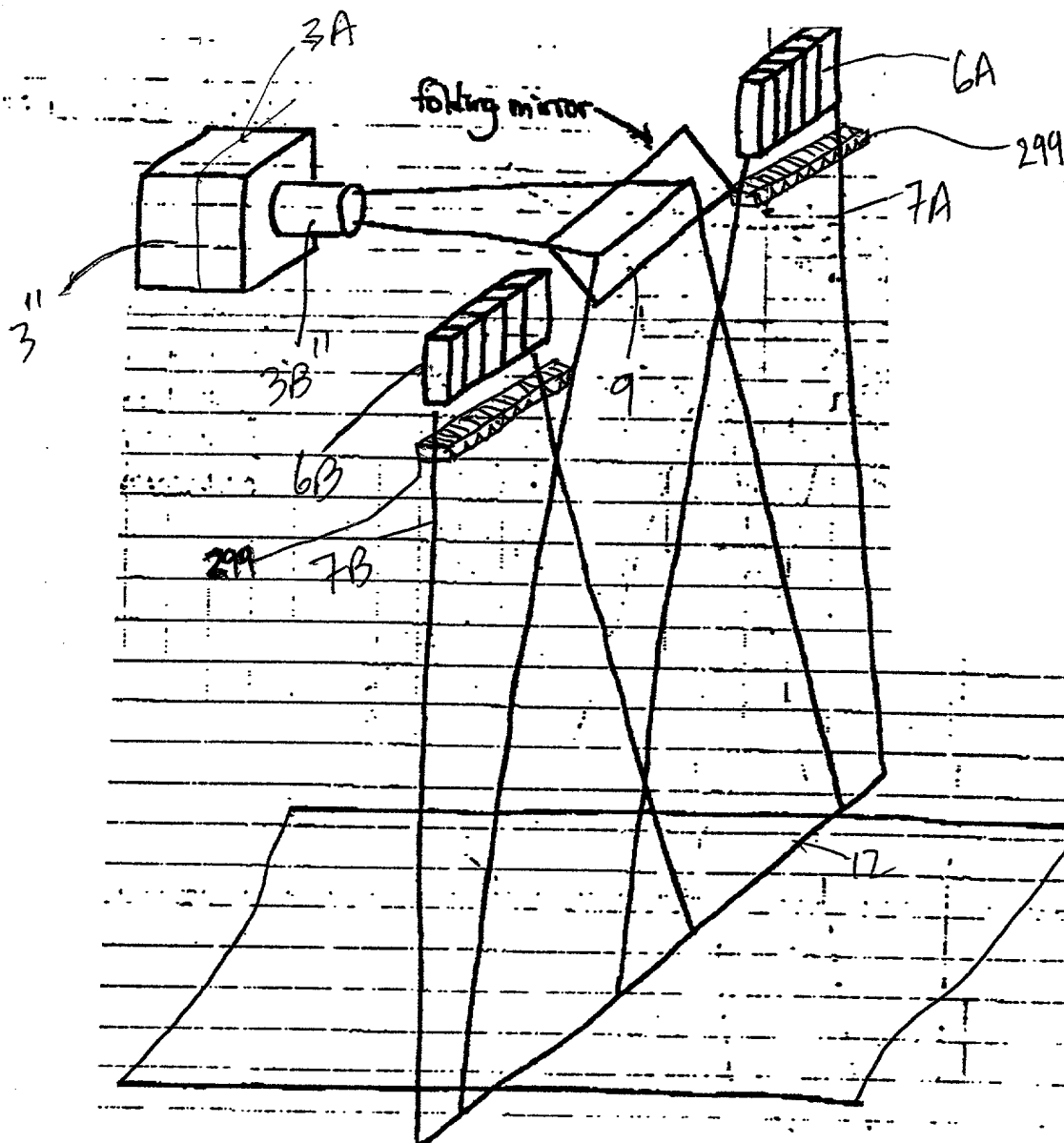


FIG. 3D5



139 | 332



503

FIG. 3E1

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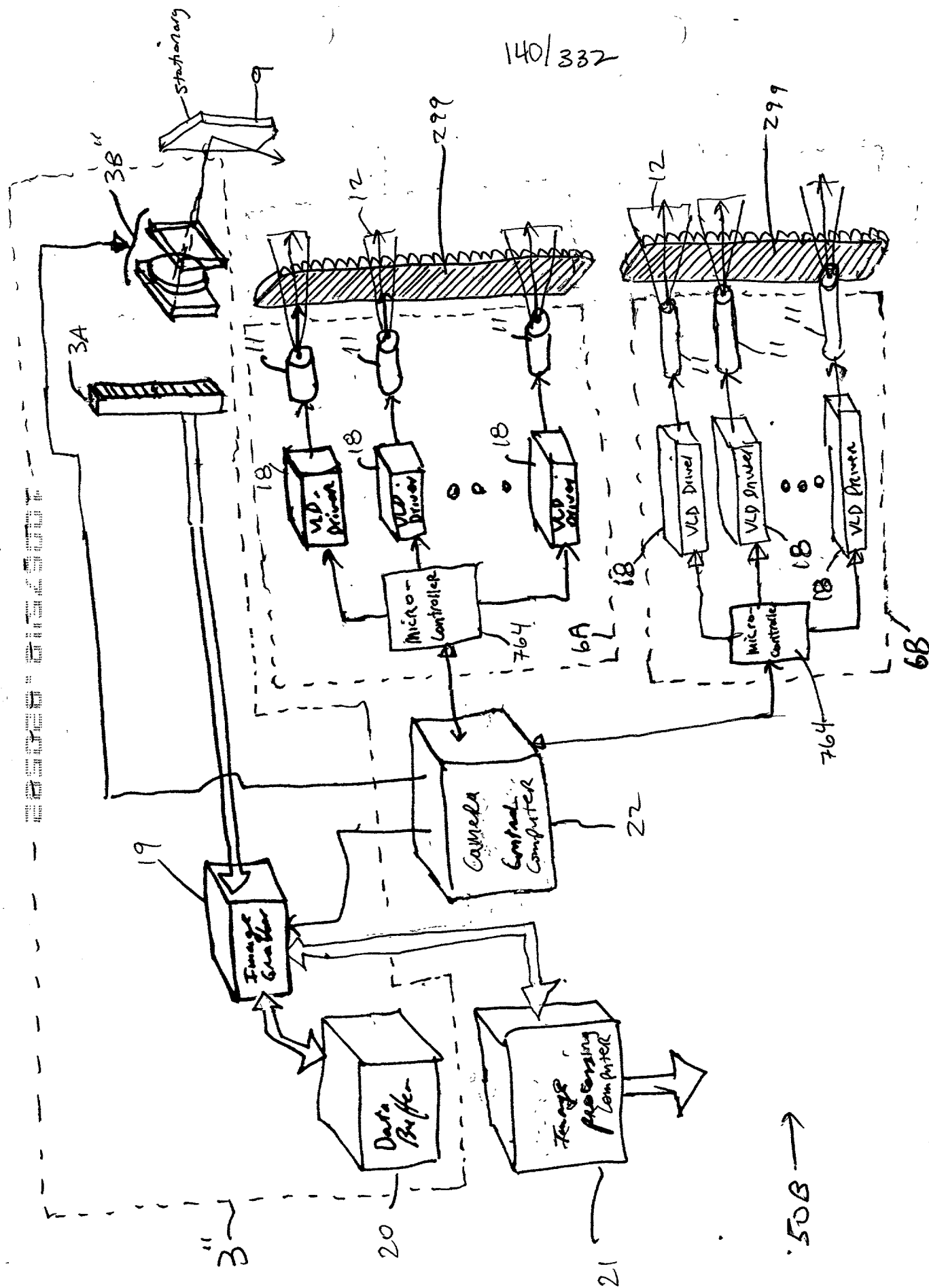
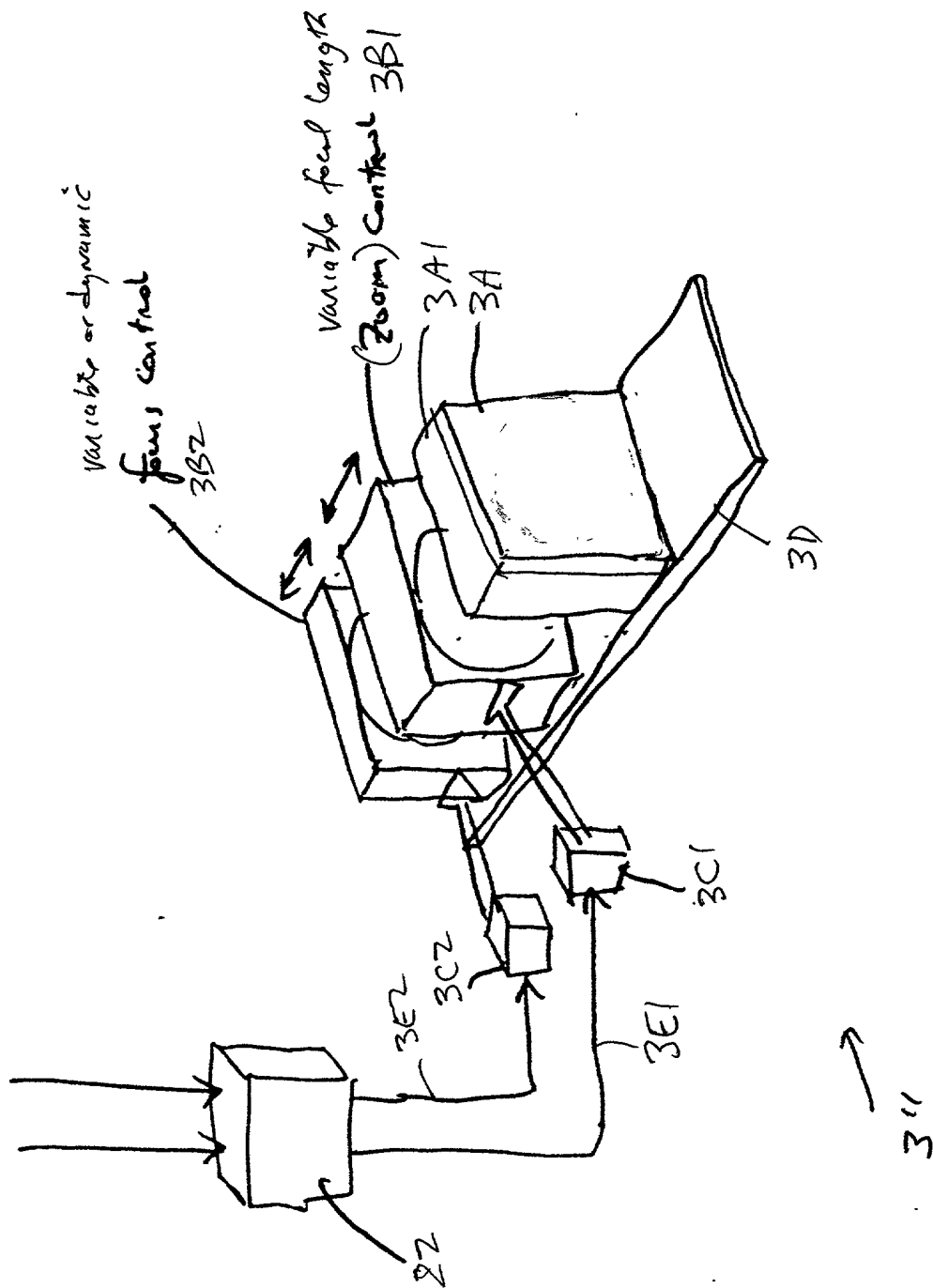


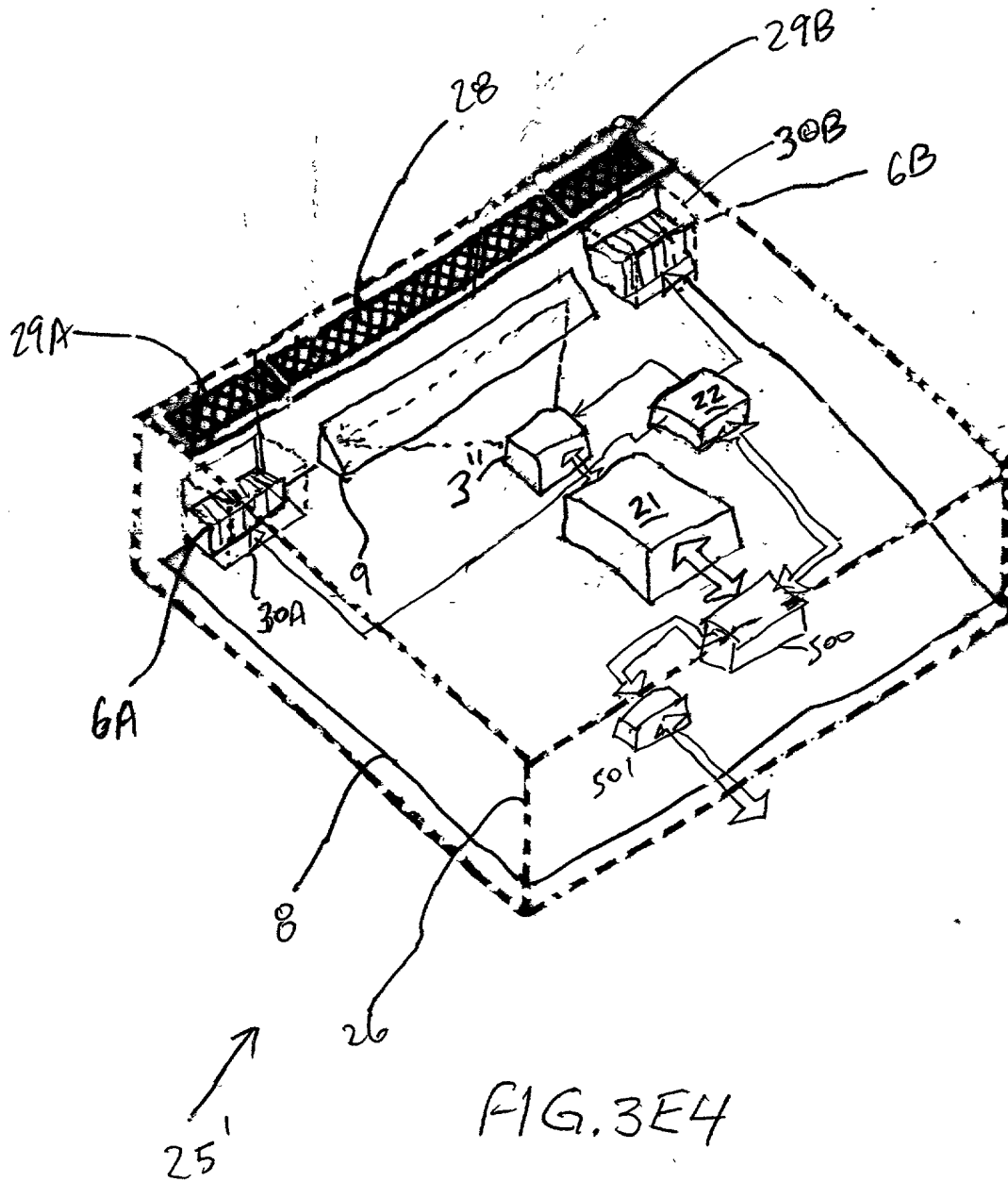
FIG. 3E2

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3E3
F/G

142 | 332



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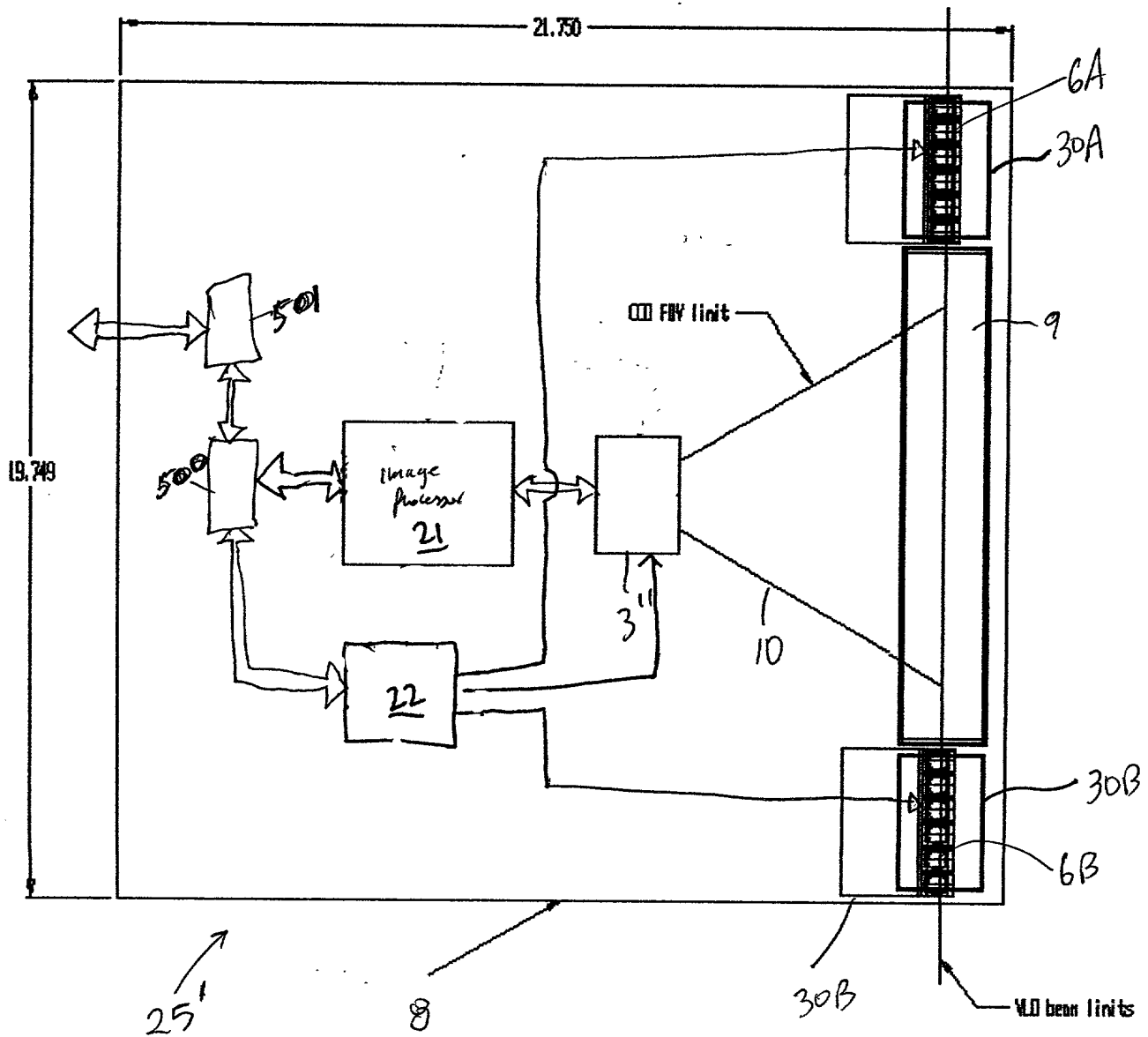


FIG. 3E5

FIG. 3E6

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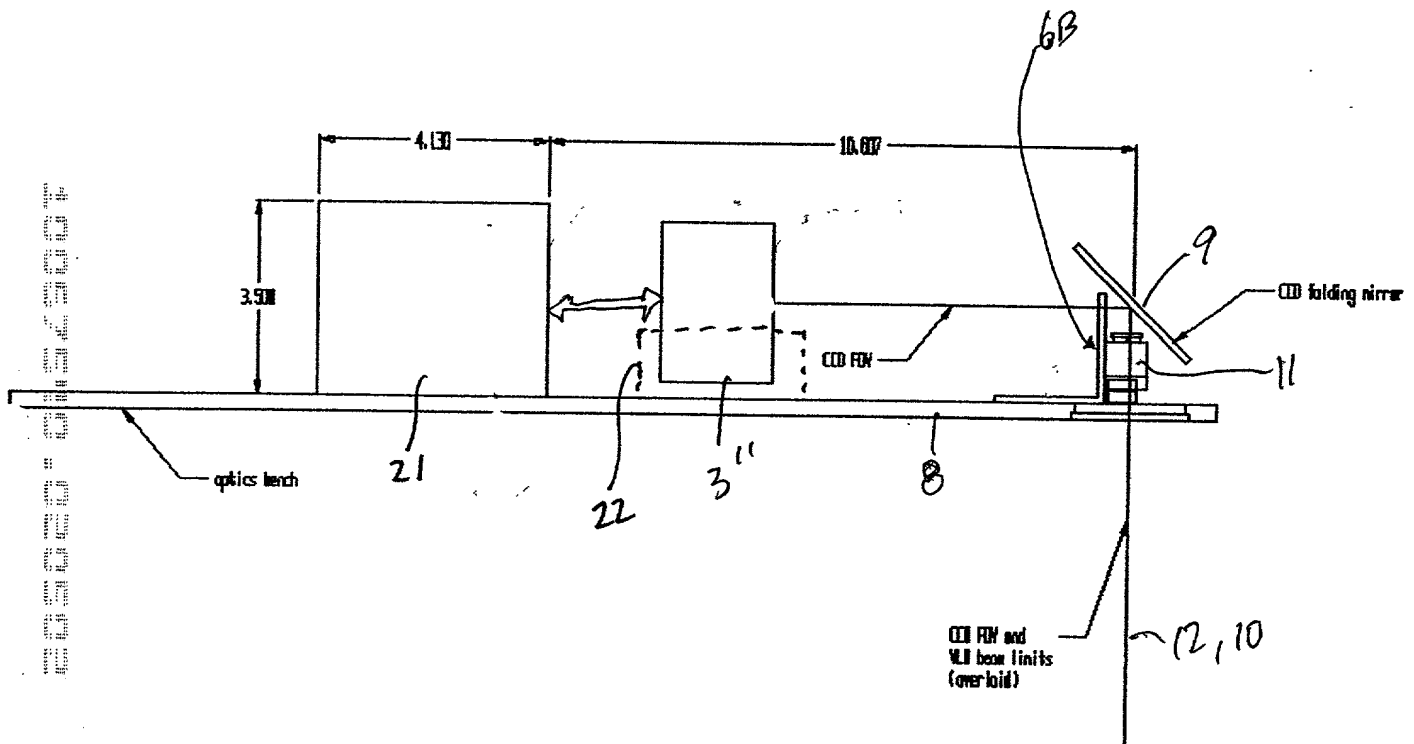
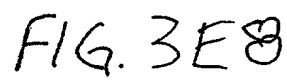


FIG. 3E7

* Variable FOV



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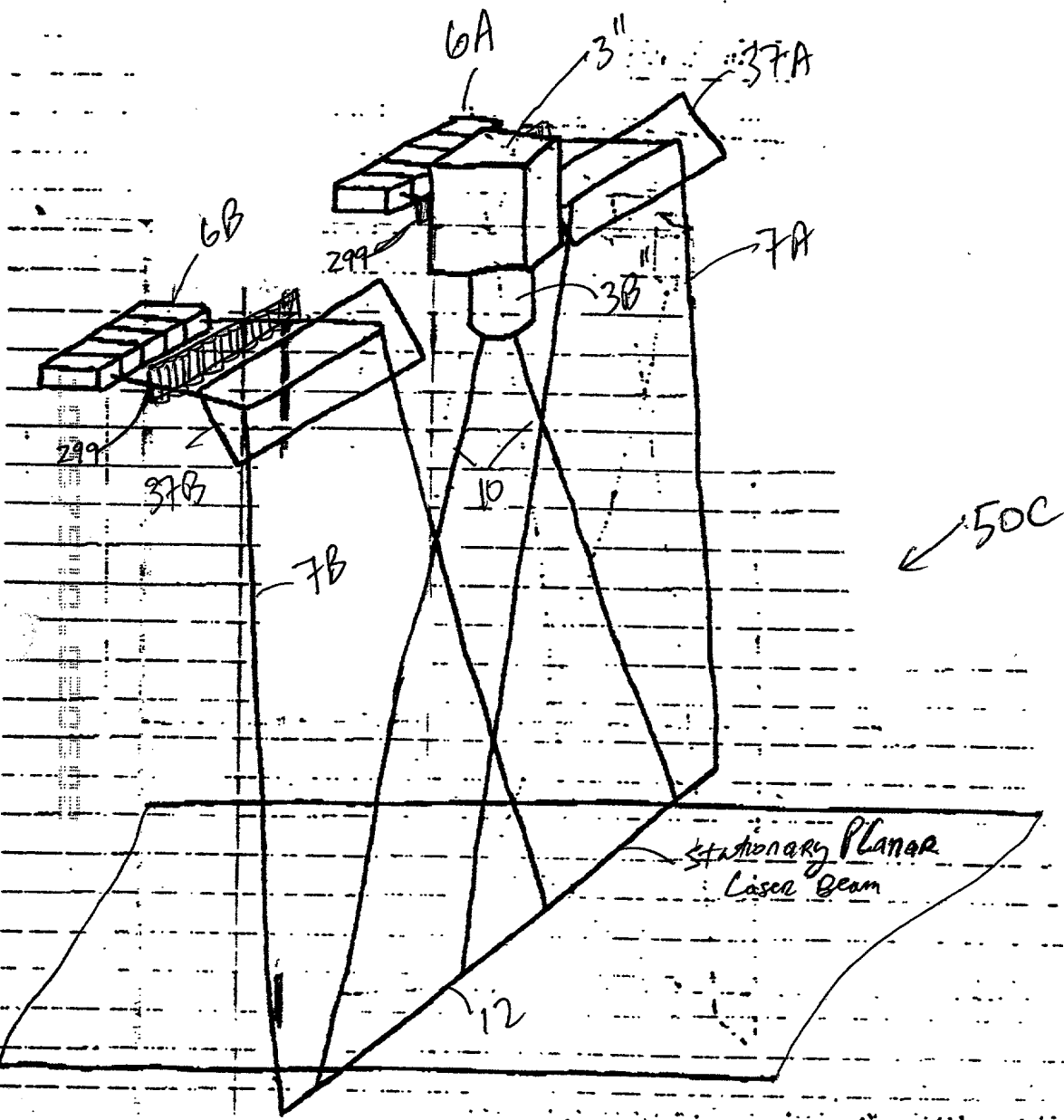


FIG. 3F1

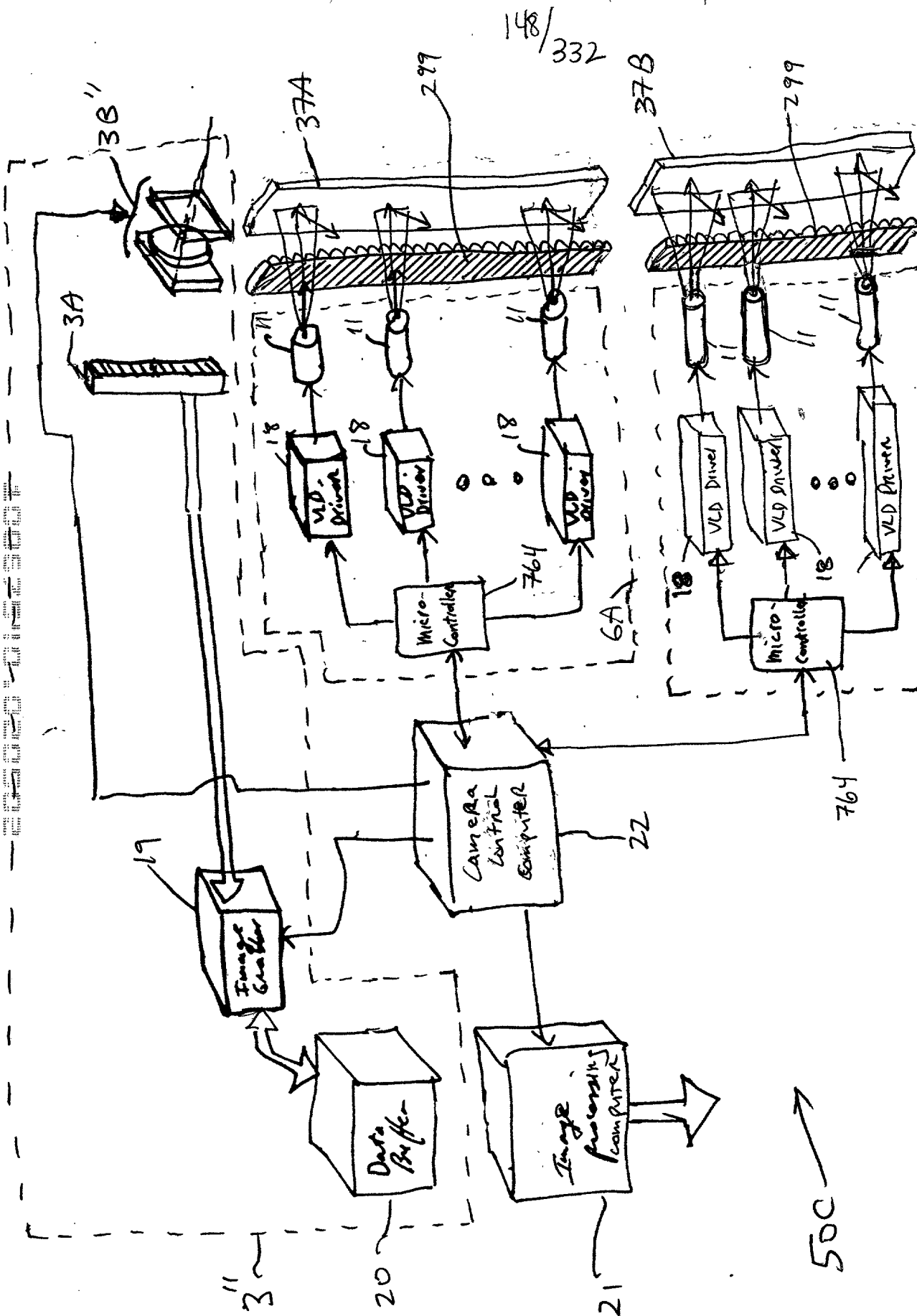


FIG. 3F2

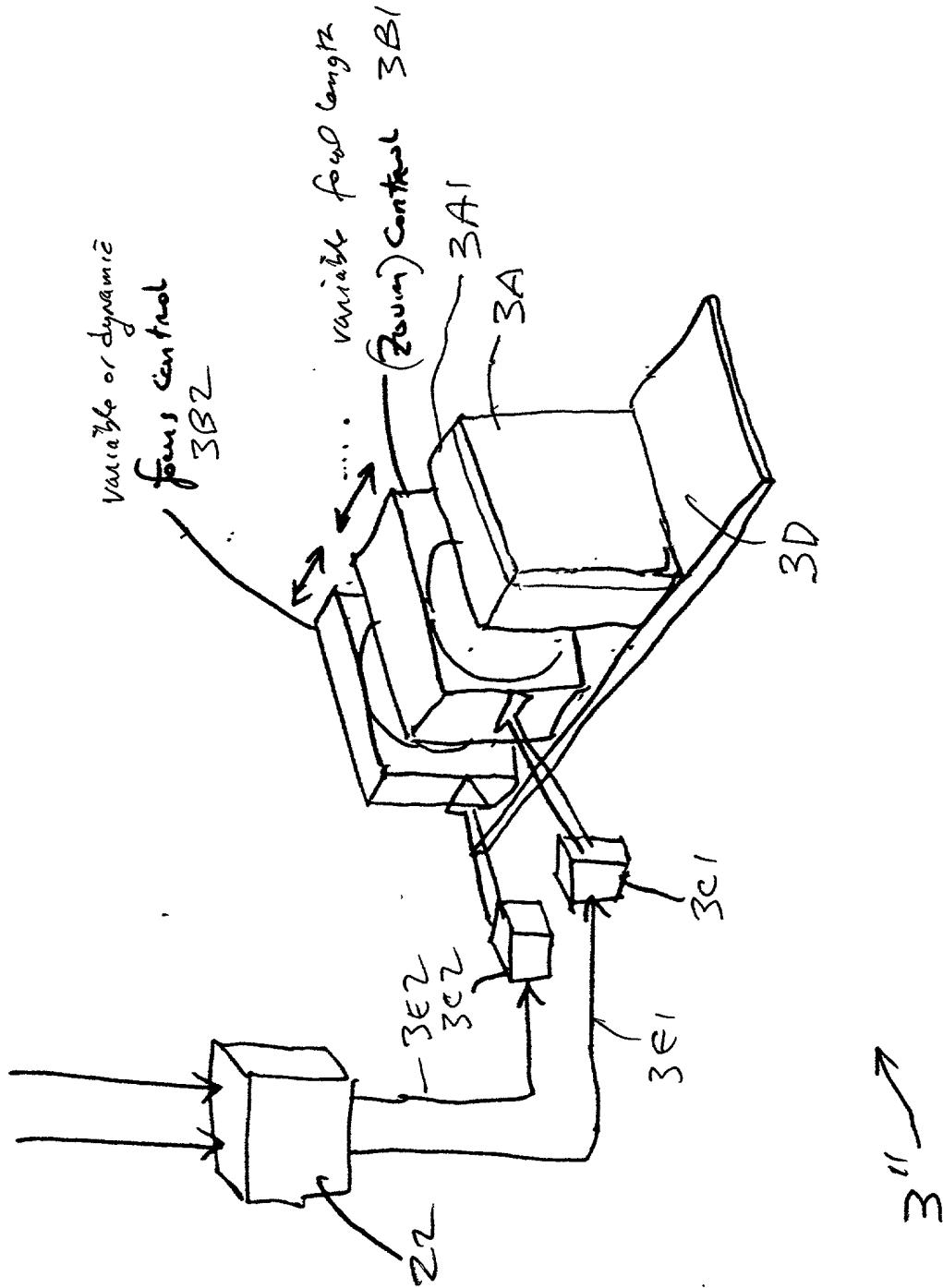


FIG. 3F3

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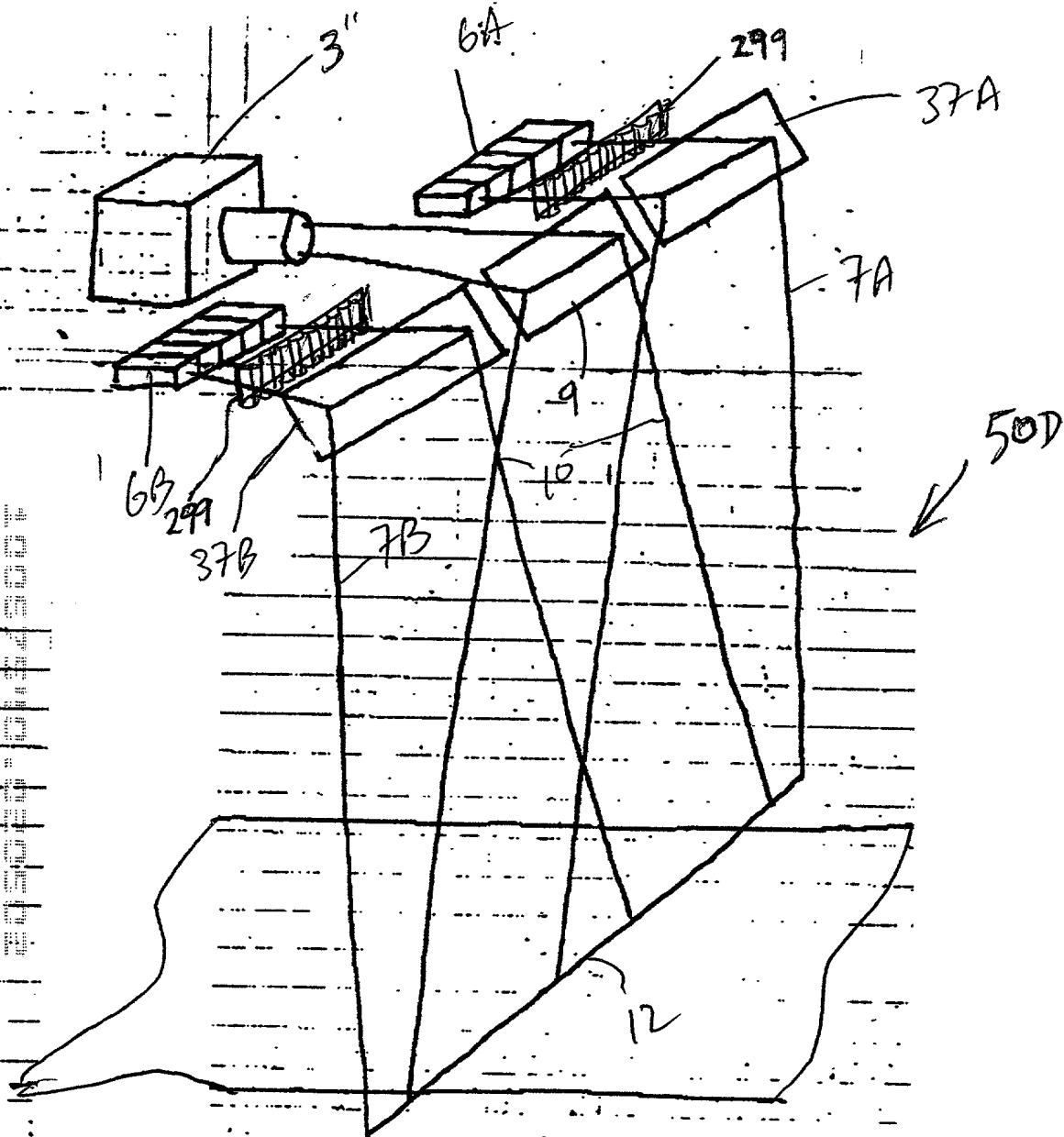


FIG. 3G1

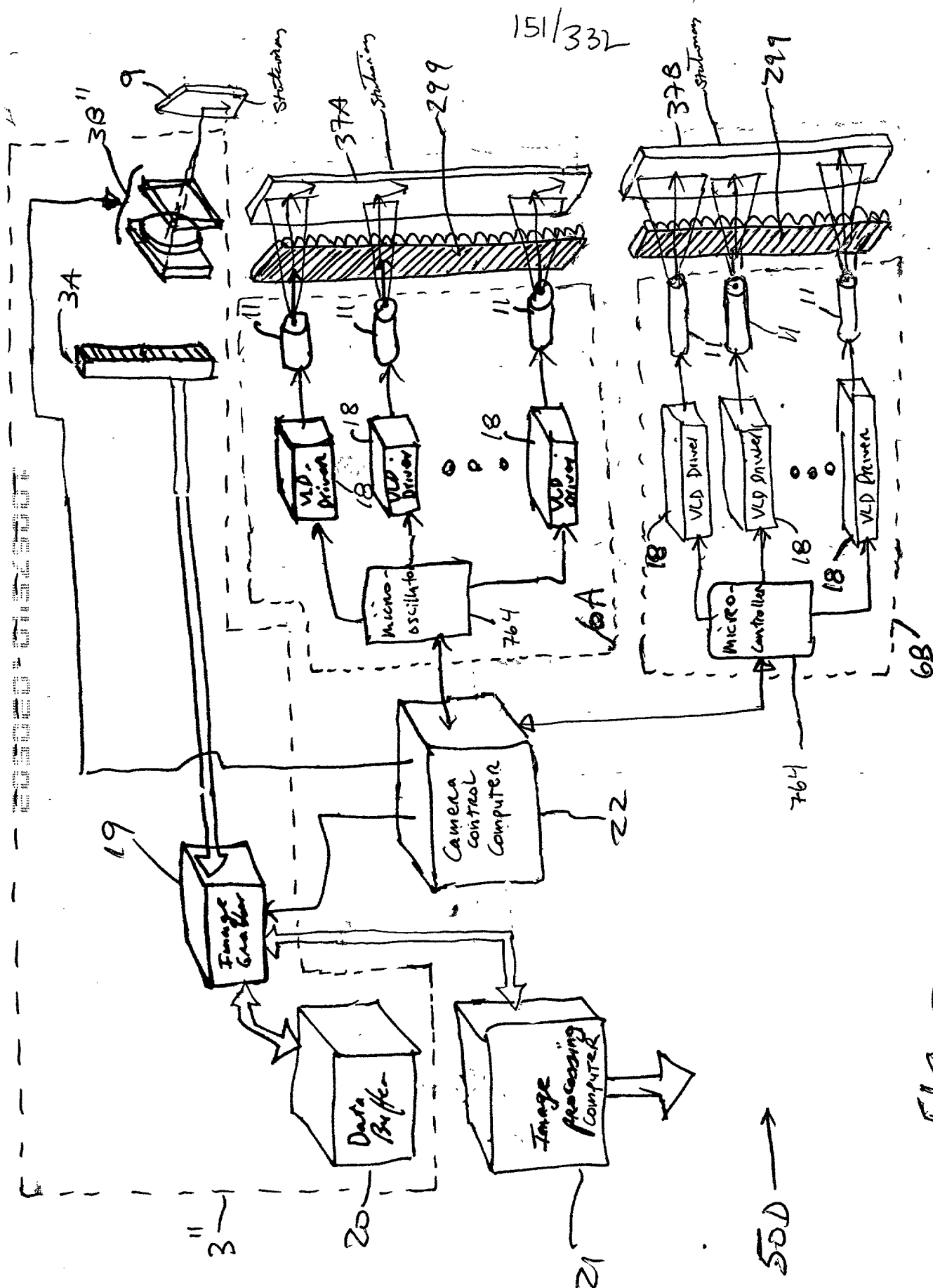


Fig. 362

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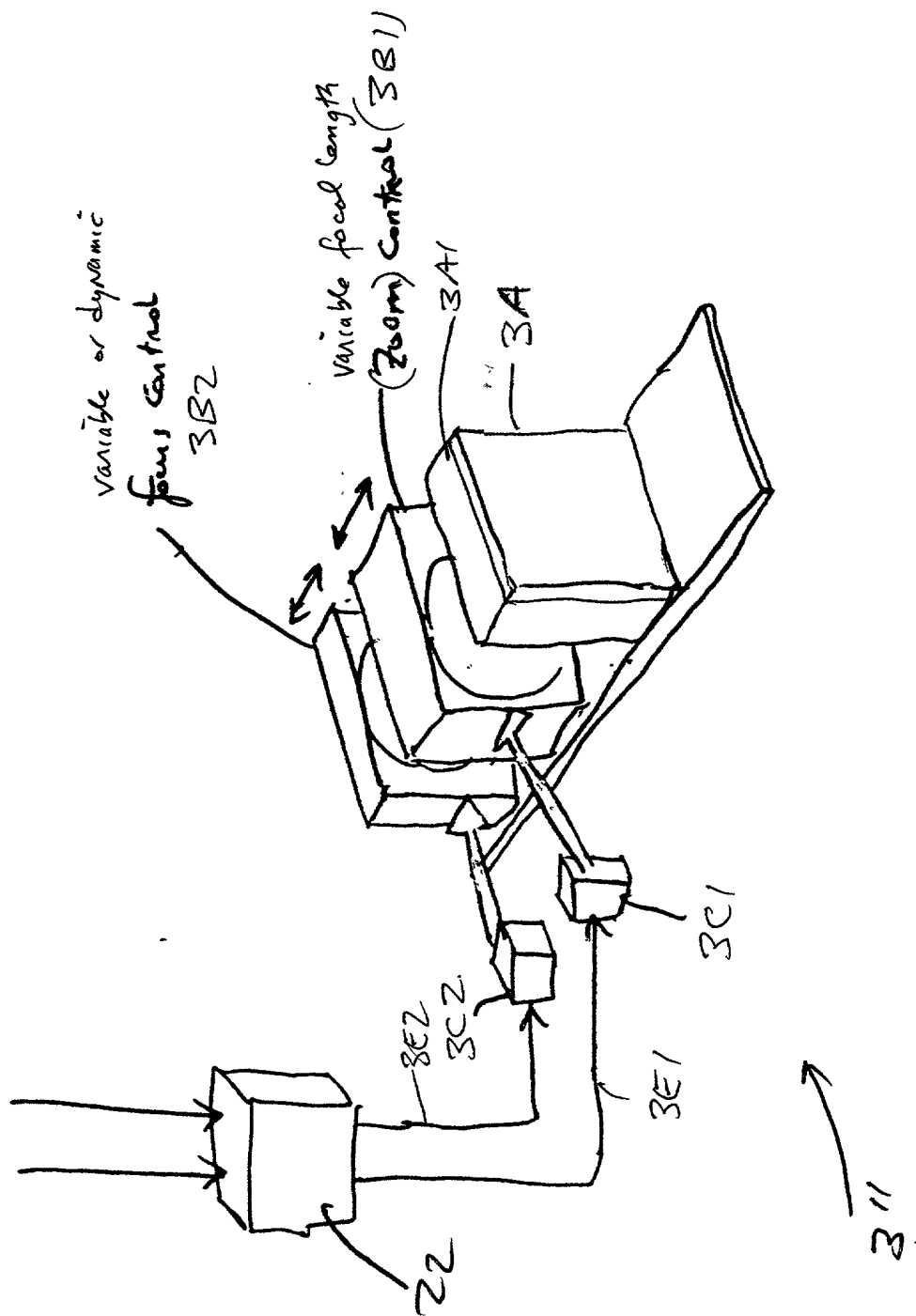


FIG. 3Q3

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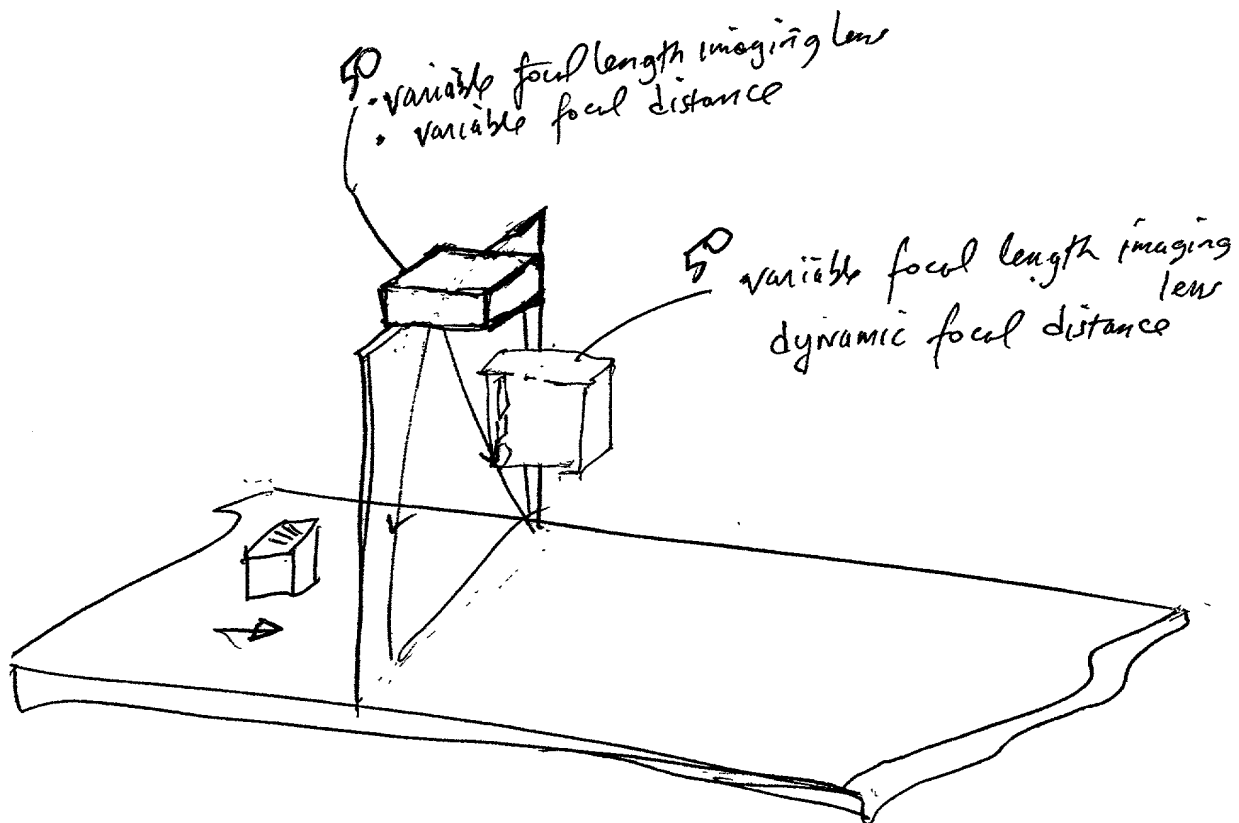


FIG. 3H

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Composite
Plane of
User
Illumination

12

FOV Limits
(10)

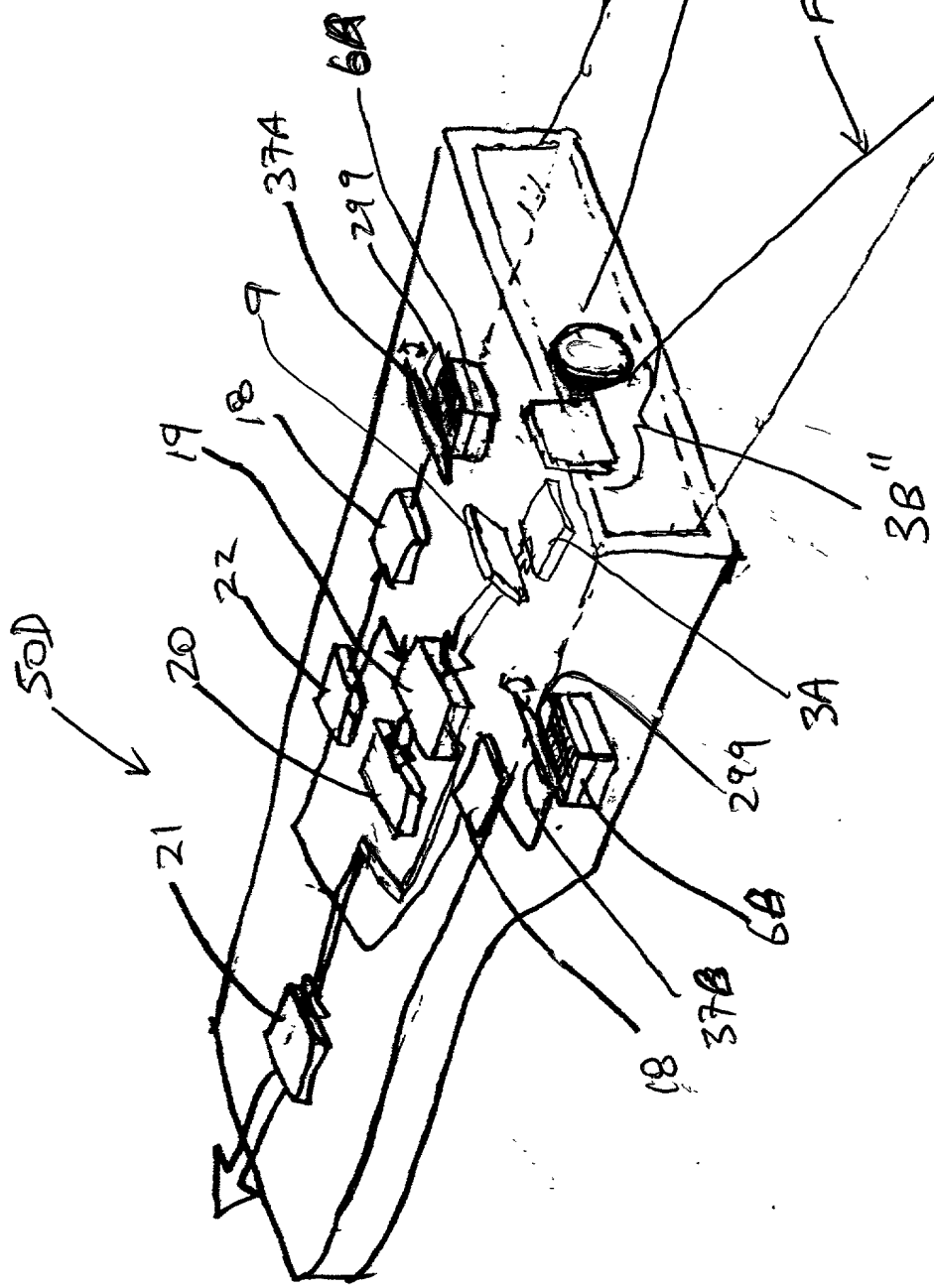


FIG. 3I

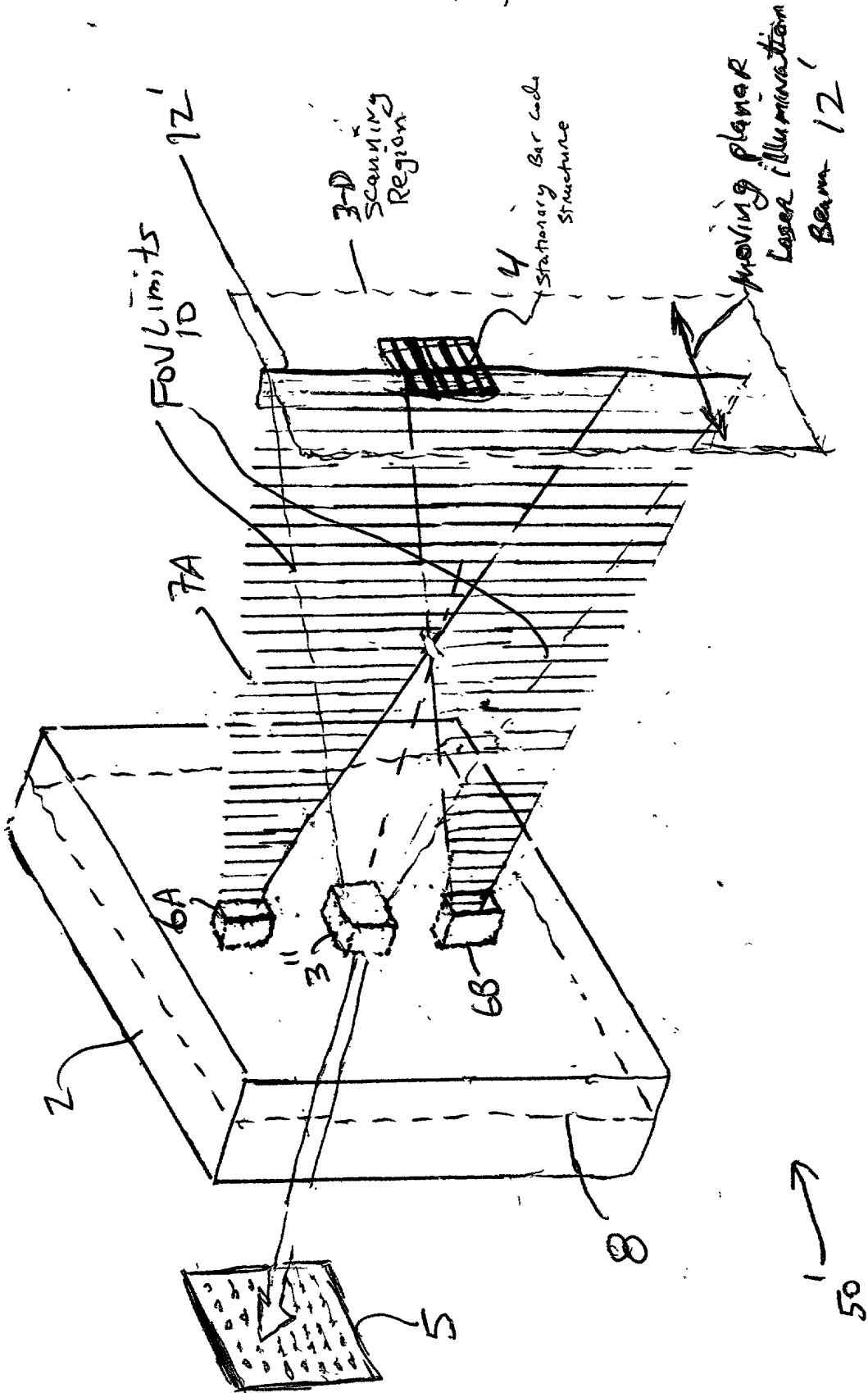


FIG. 3J1

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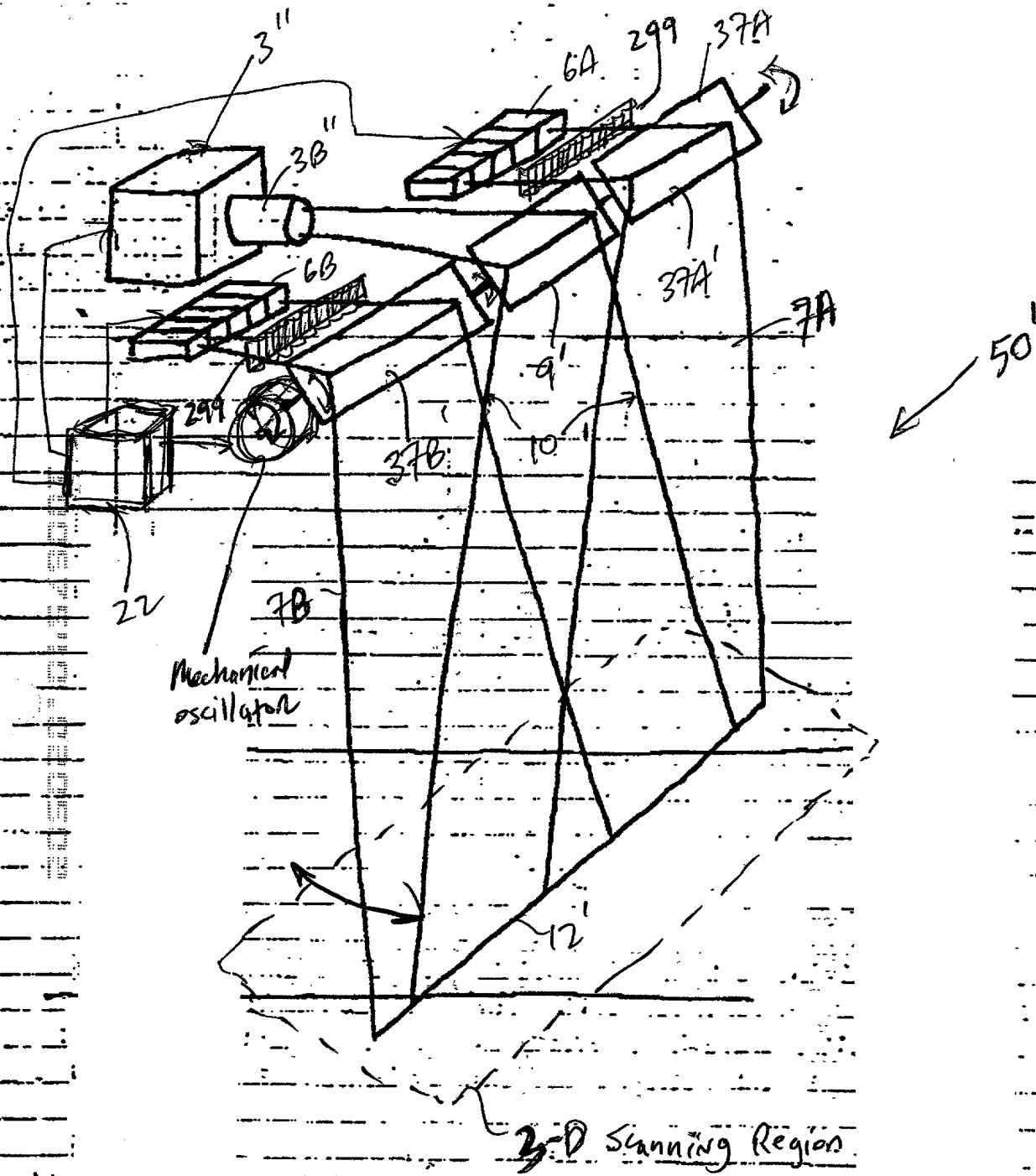


FIG 3J2

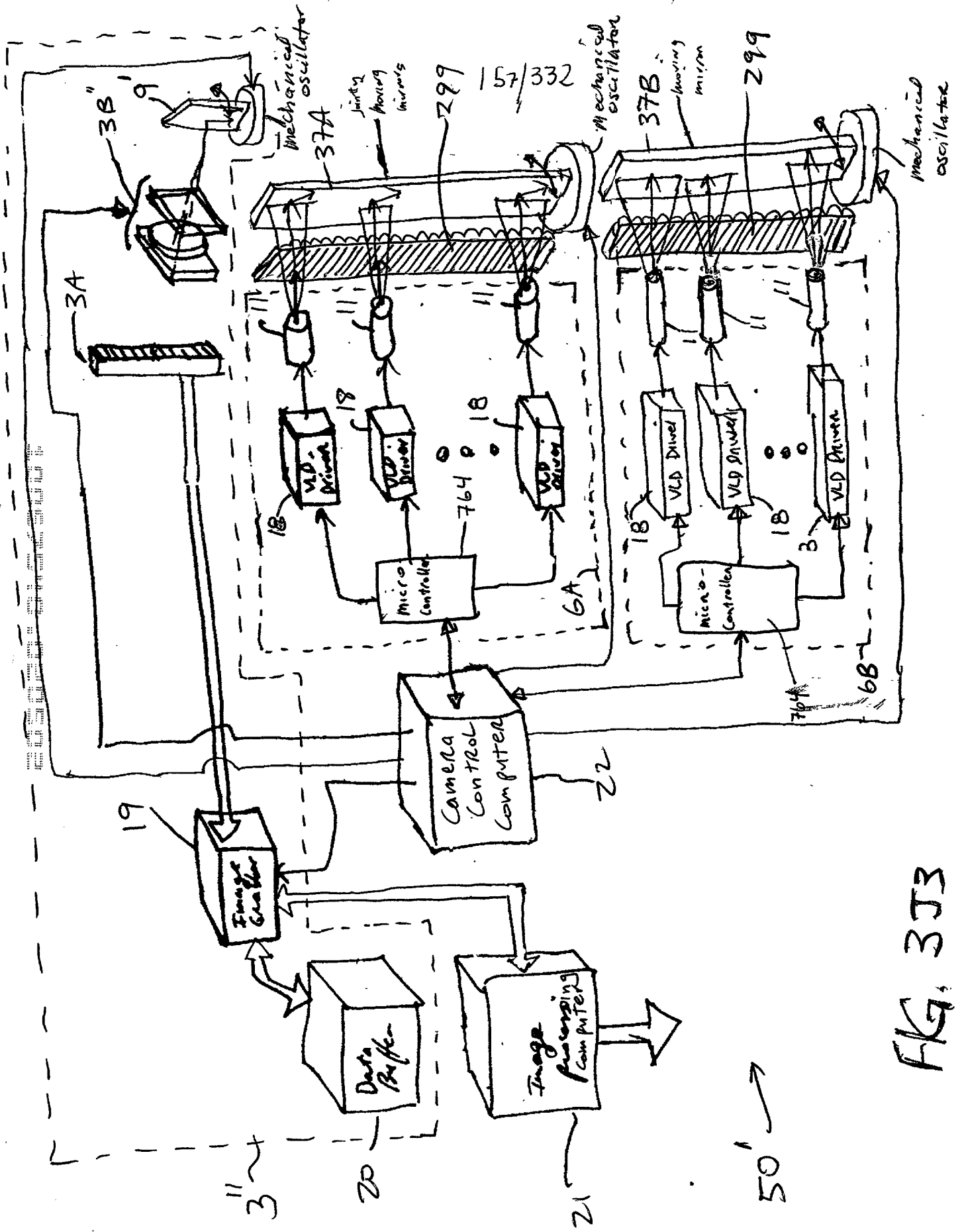


FIG. 3J3

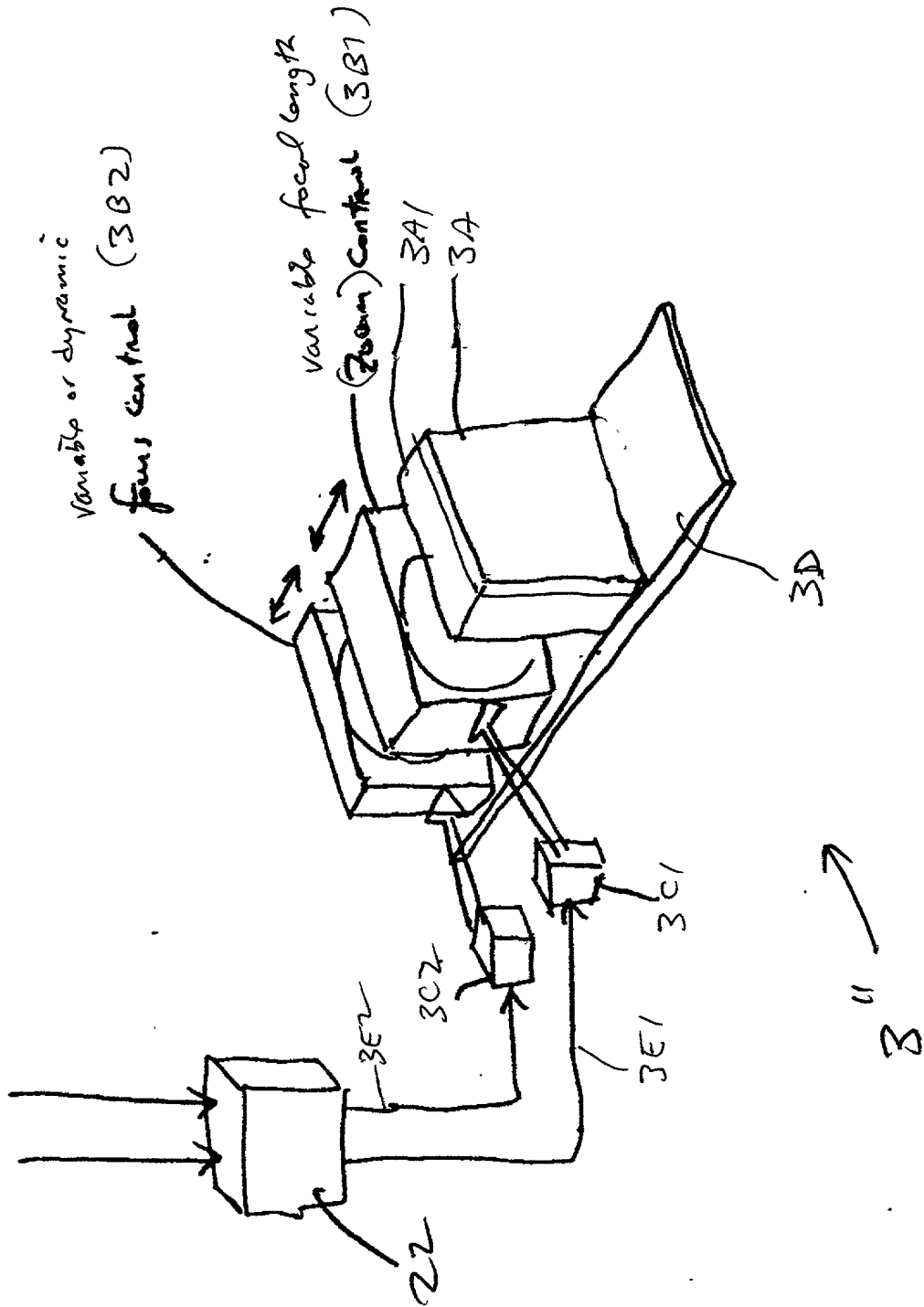


FIG. 354

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Composite
Plane of
Laser
Illumination

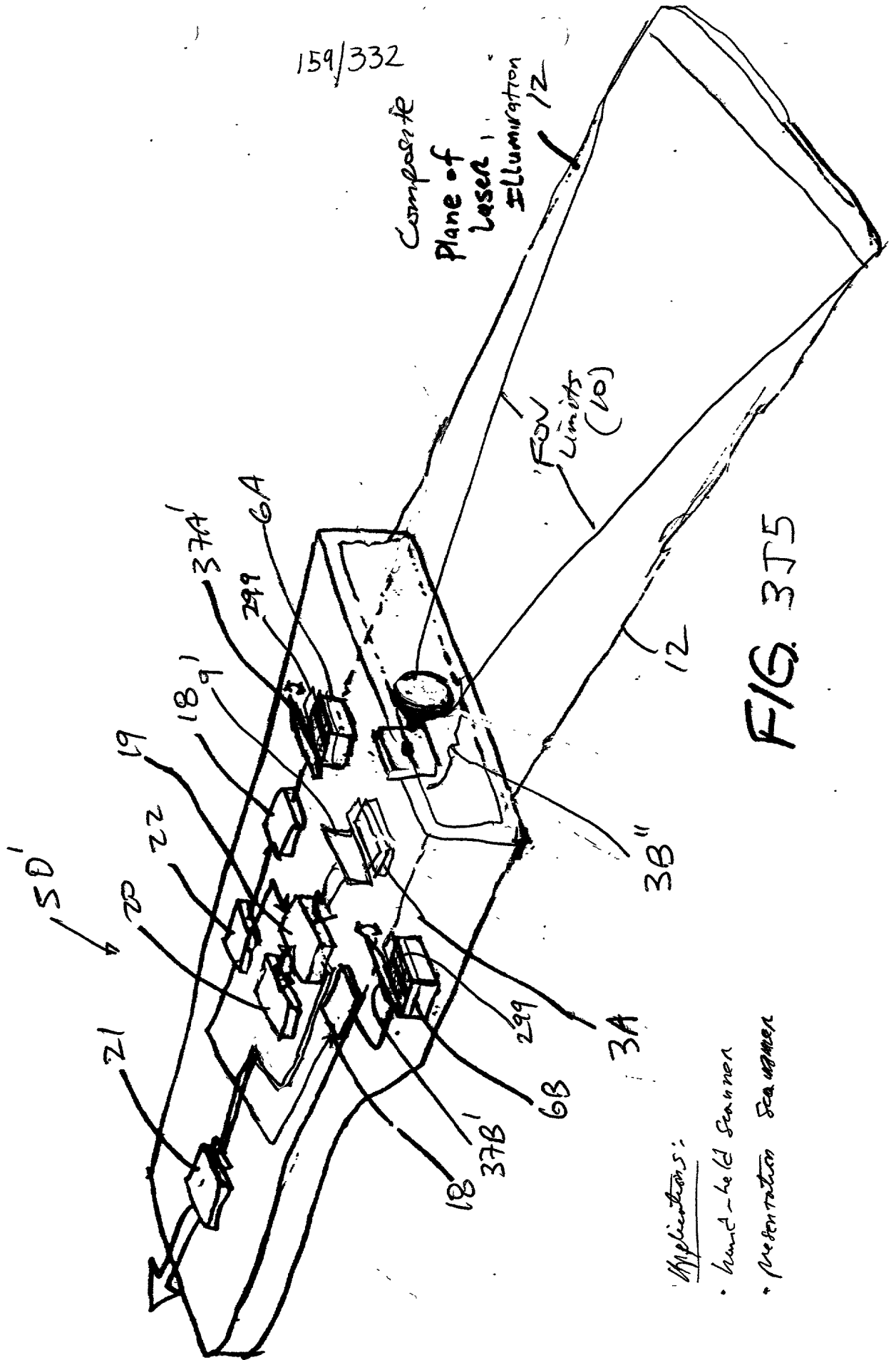
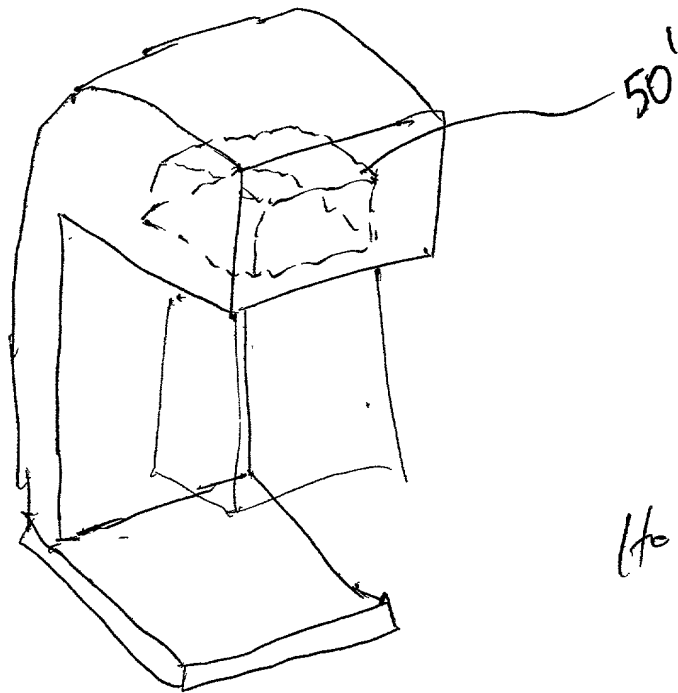


FIG. 315

Applications:

- hand-held scanner
- penetration scanner

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2-D
hold-up der
Scanner

FIG. 316

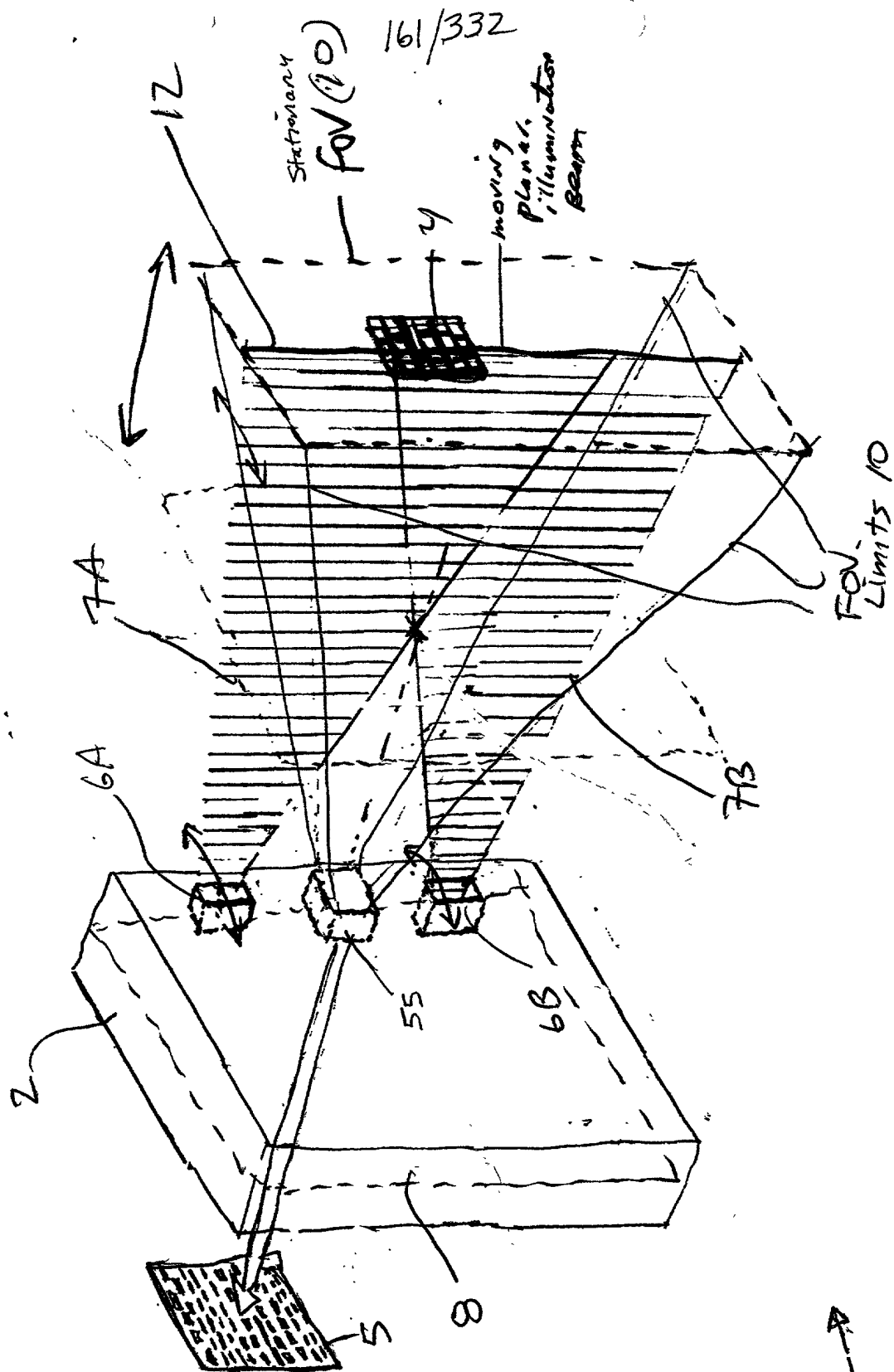


FIG 4A

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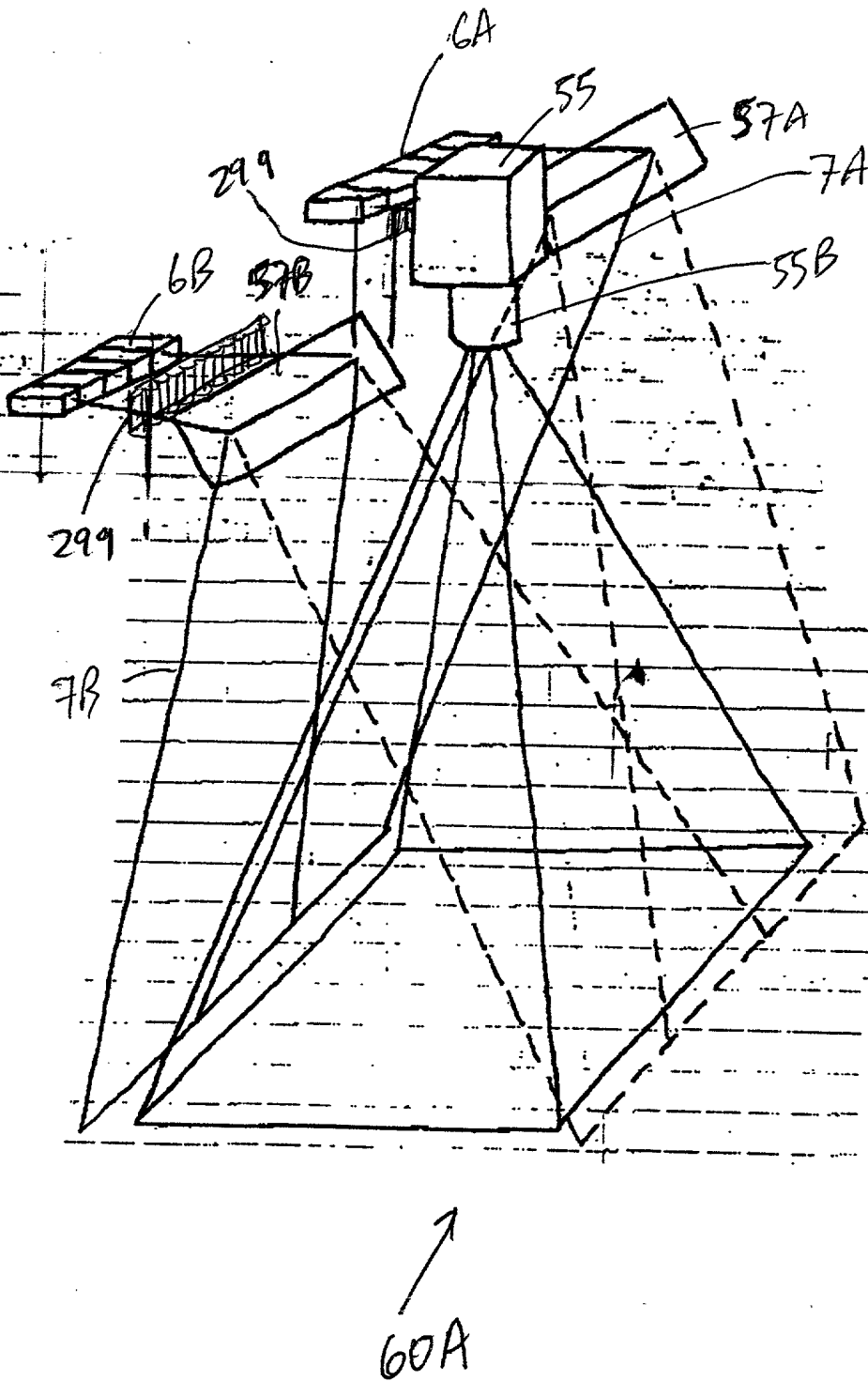
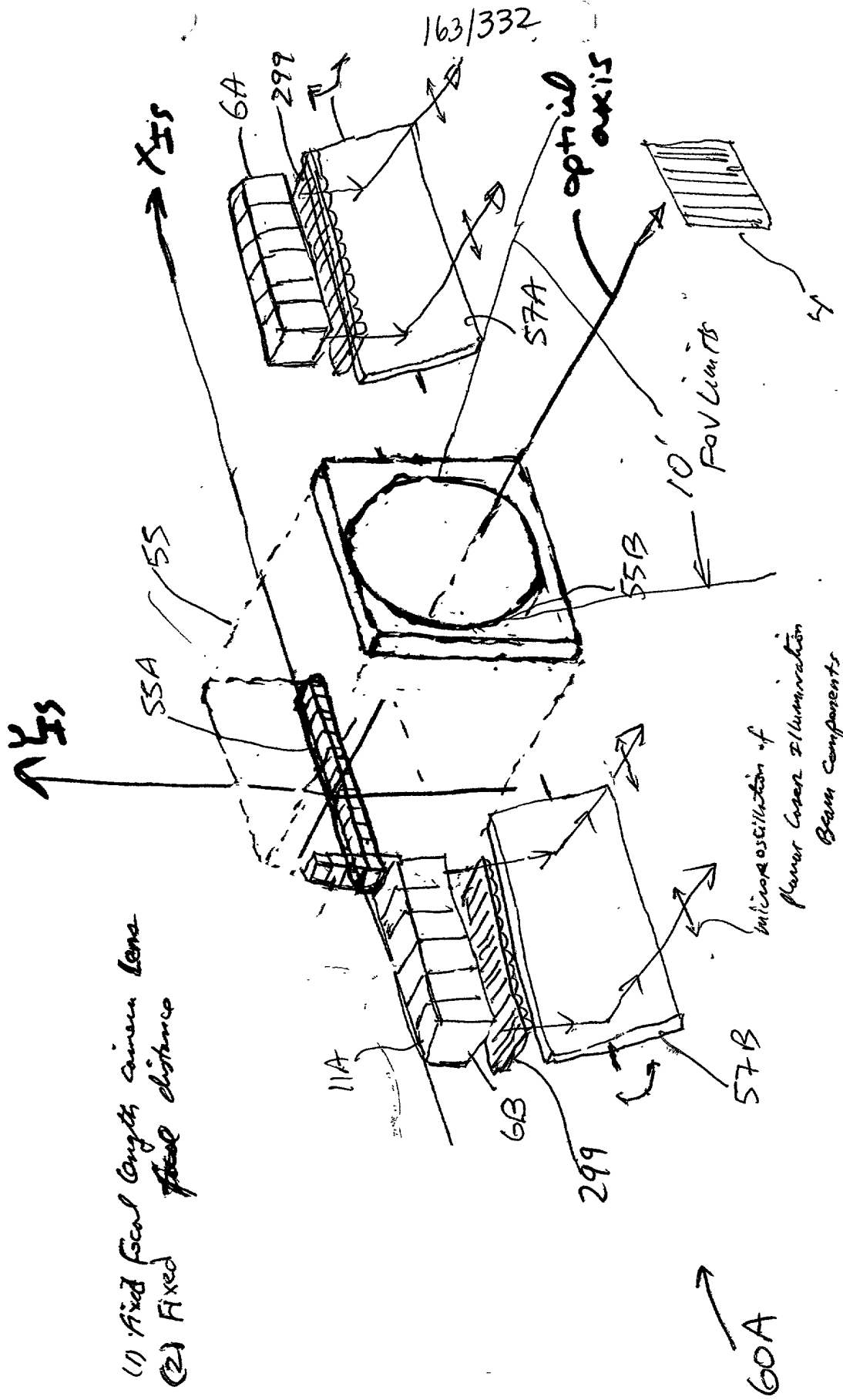


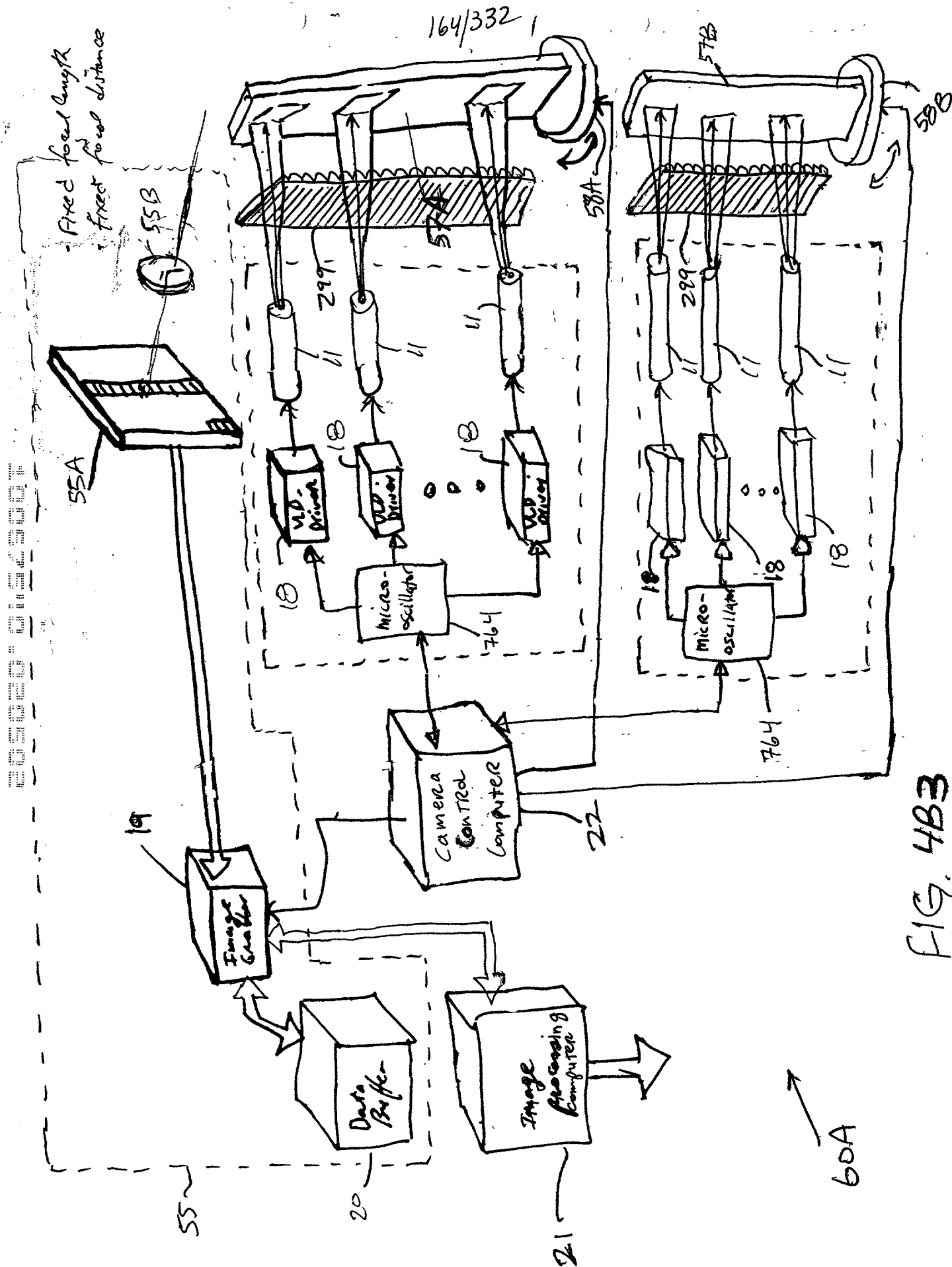
FIG. 4B1

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- (1) Fixed focal length camera lens
- (2) Fixed ~~fixed~~ distance

FIG. 4B.2



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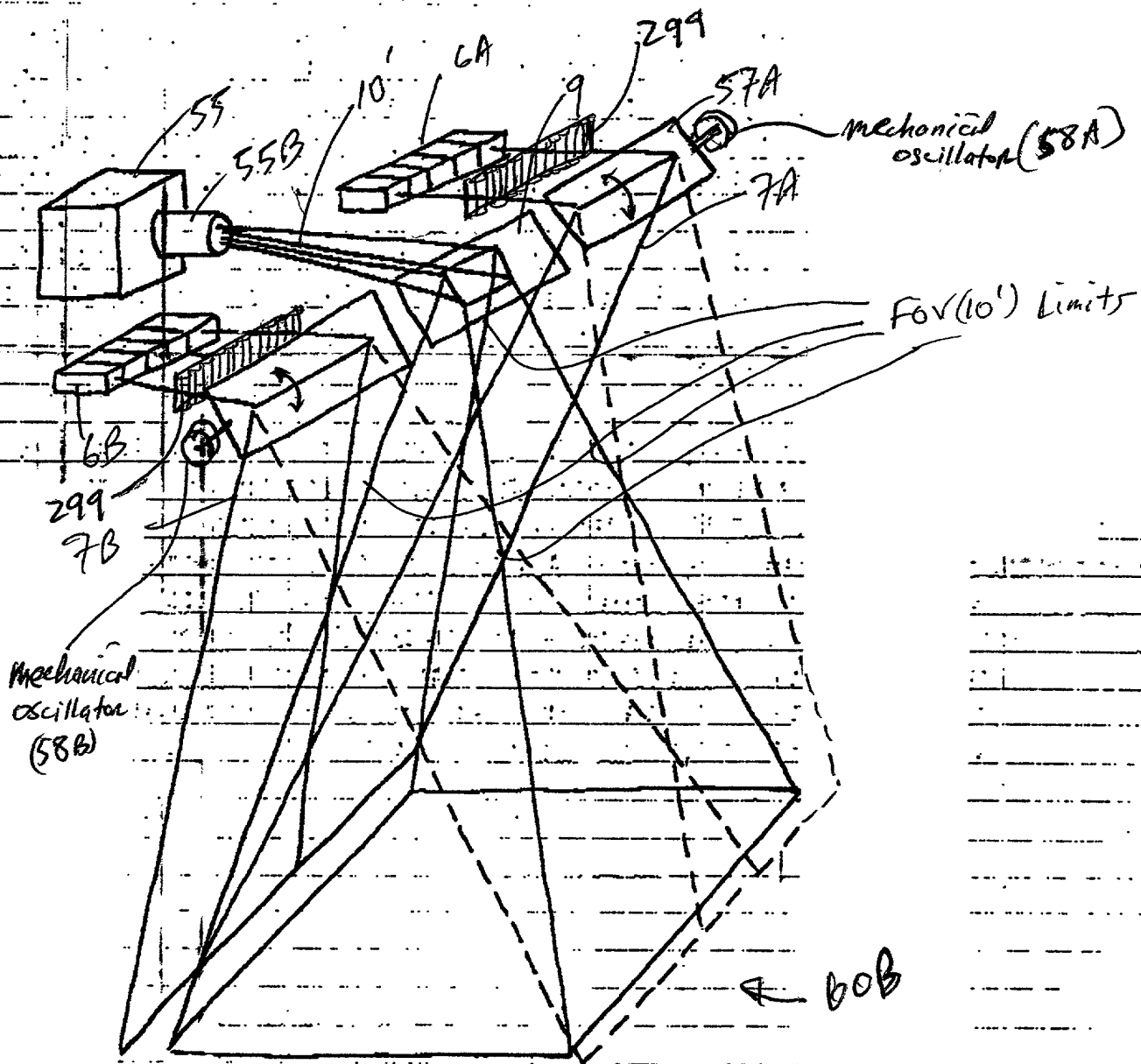


FIG. 4C1

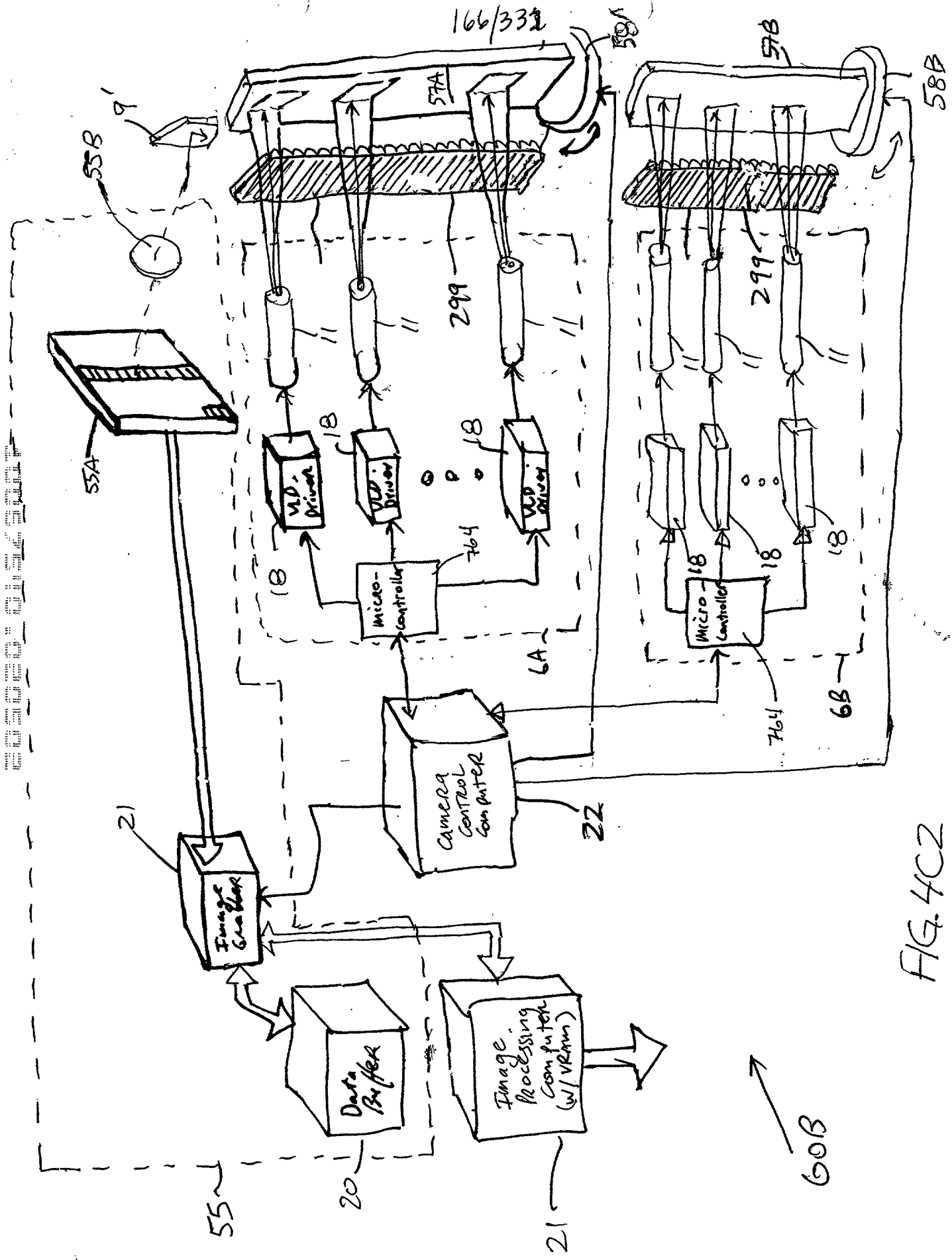


FIG. 4C2

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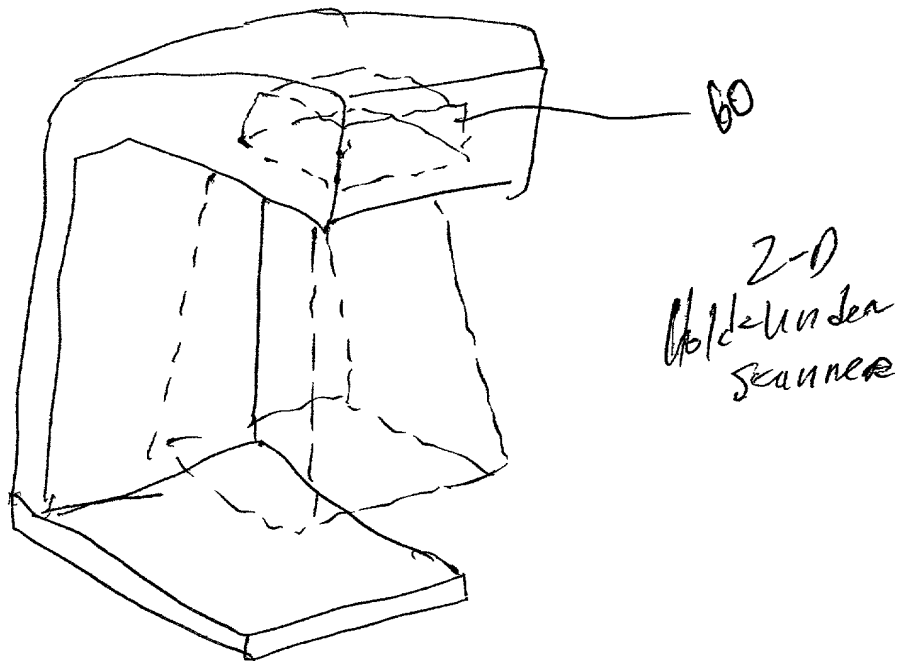


FIG. 4D

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Plane of
laser
illumination

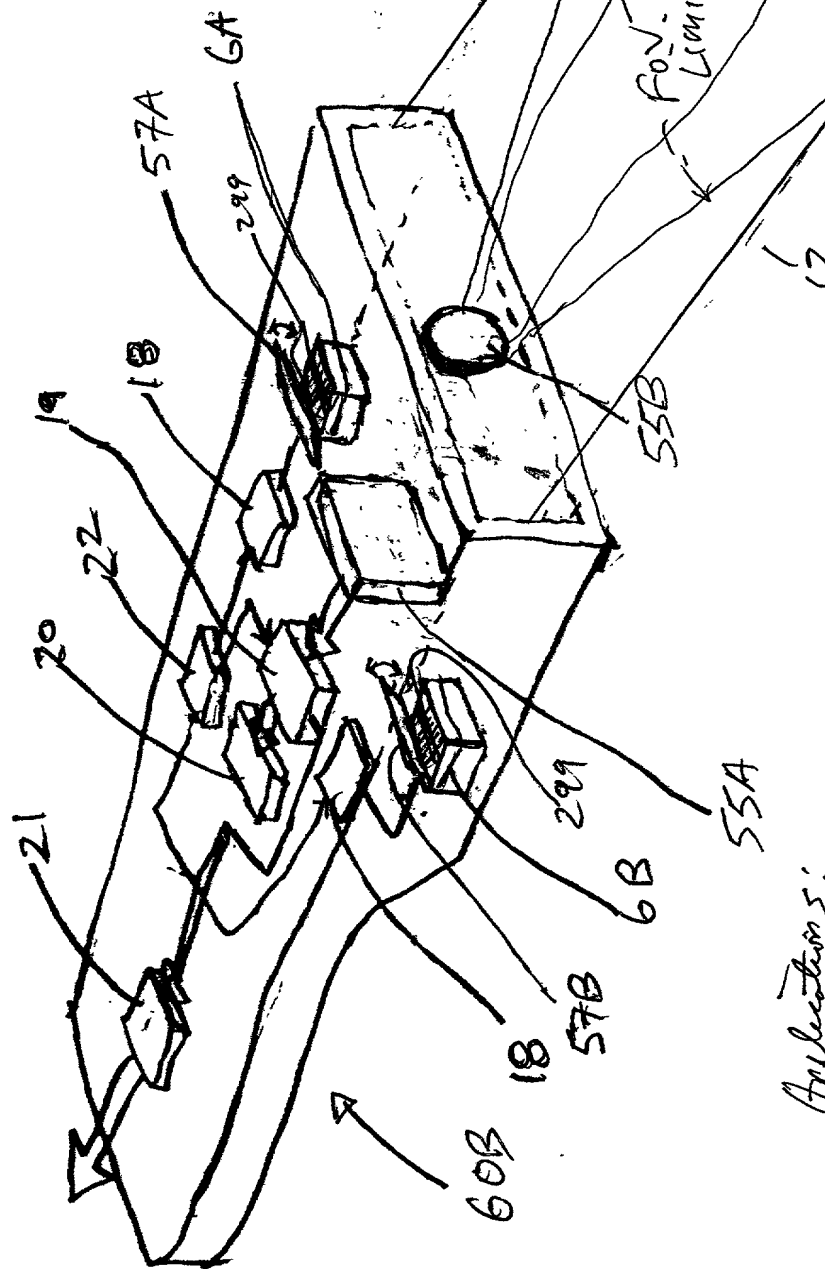


FIG. 4E

- Applications:
- Hand-held Scanner
 - Presentation Scanner

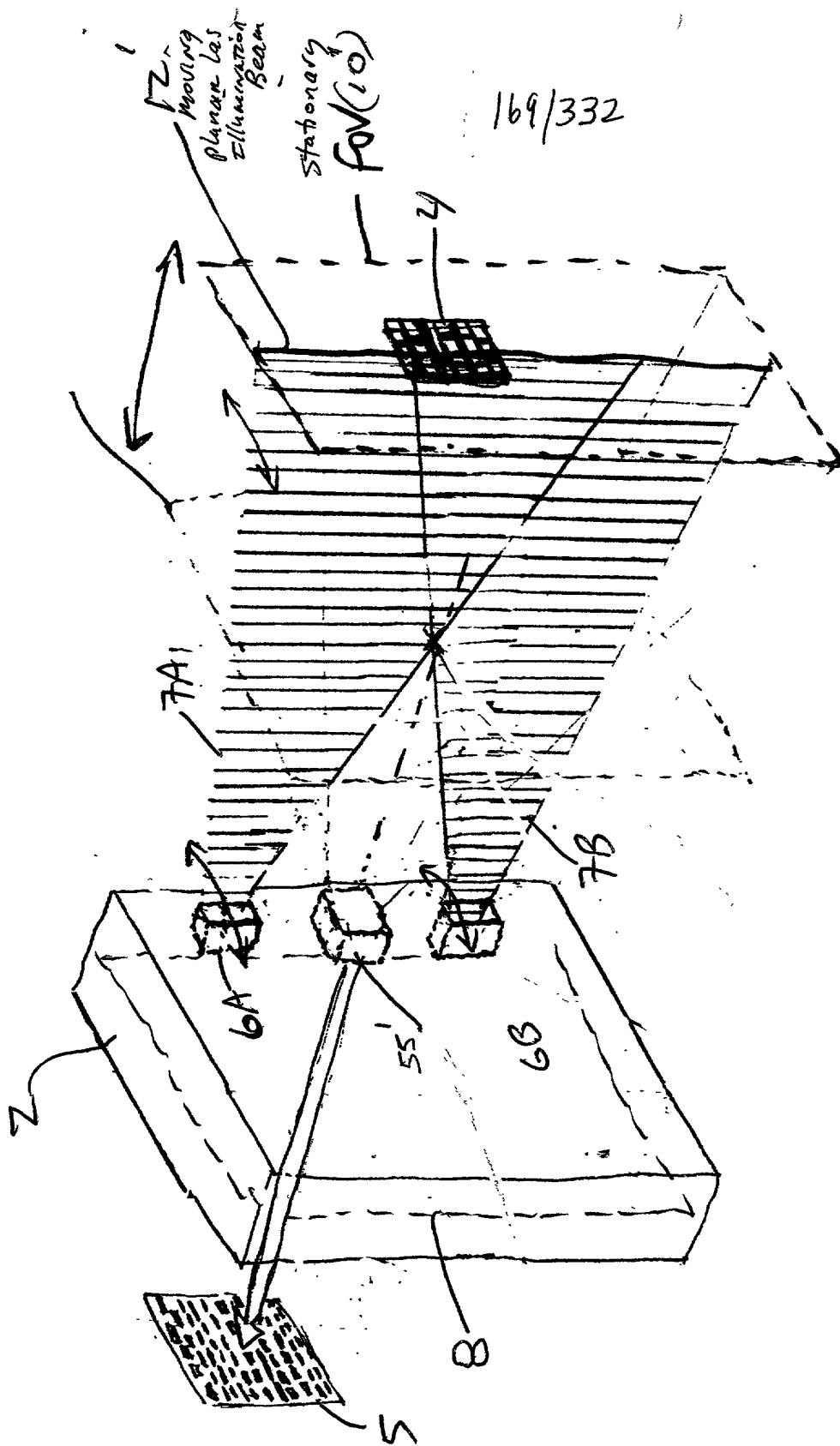


FIG 5A

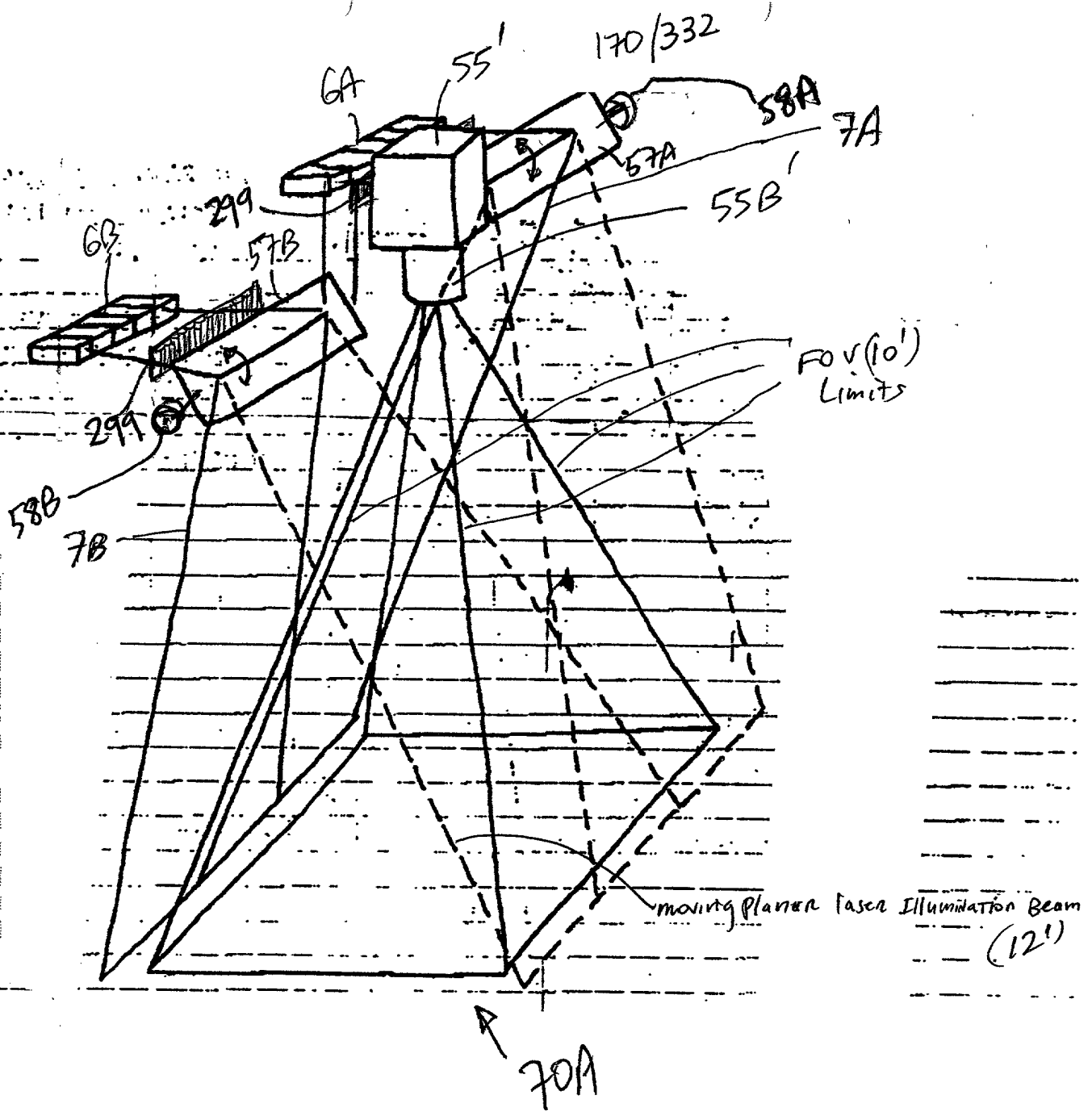


FIG 5B1

- (1) $\text{Fixed focal length camera lens}$
- (2) $\text{Variable focal distance}$

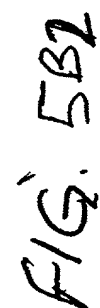


FIG. 5B2

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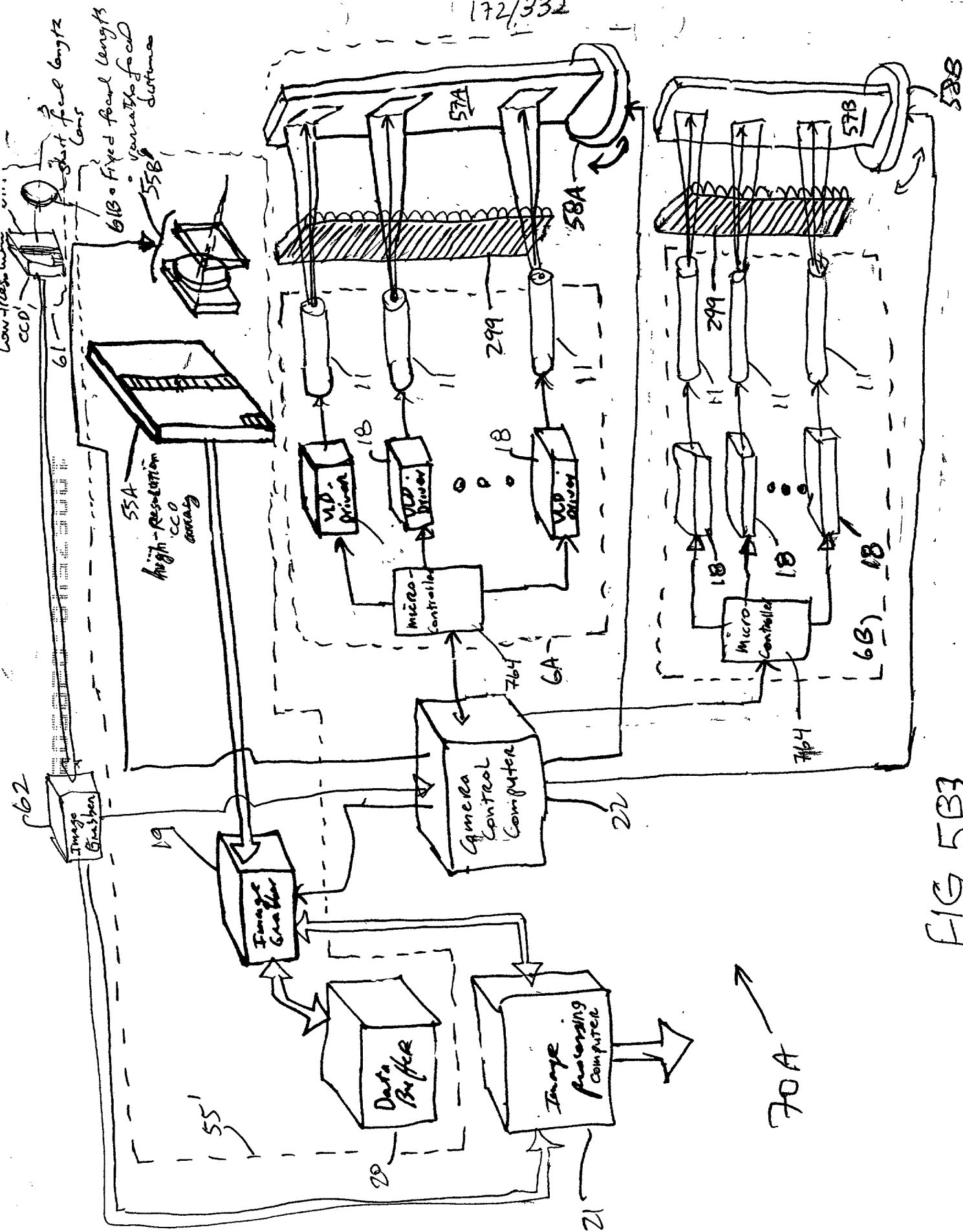


FIG. 5B3

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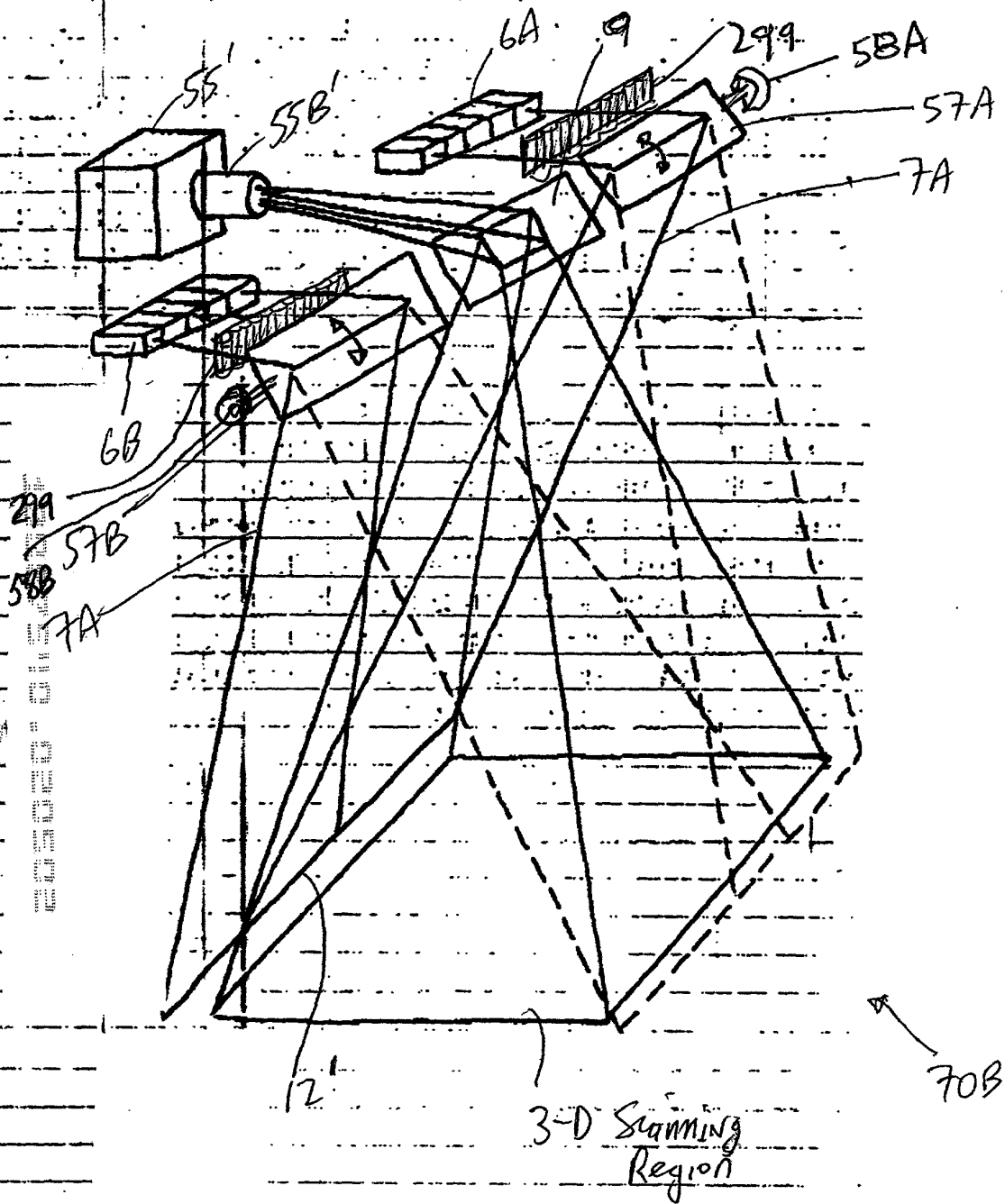
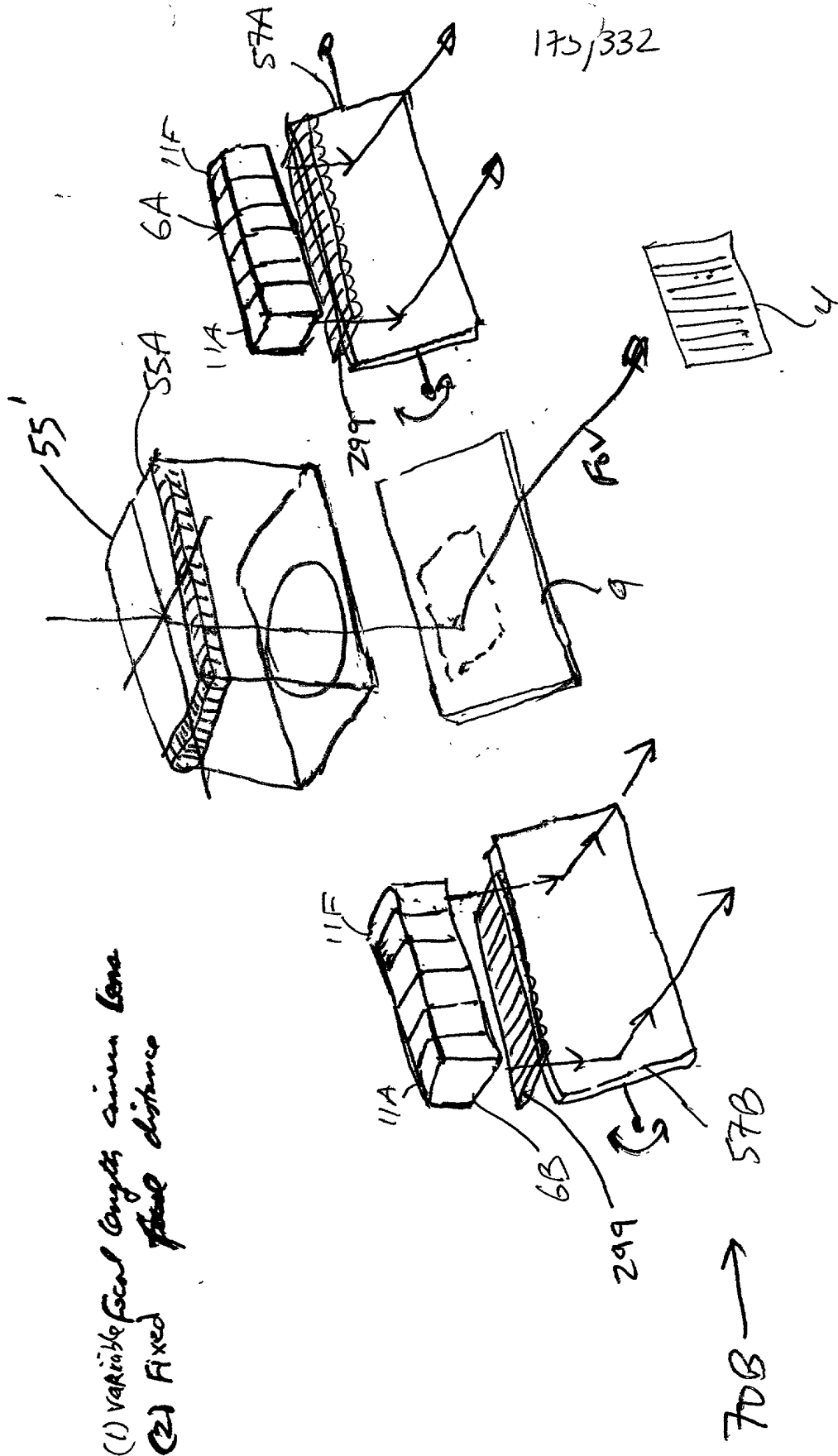


FIG. 5C1

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(1) Variable focal length lens
(2) Fixed distance

FIG. 5C

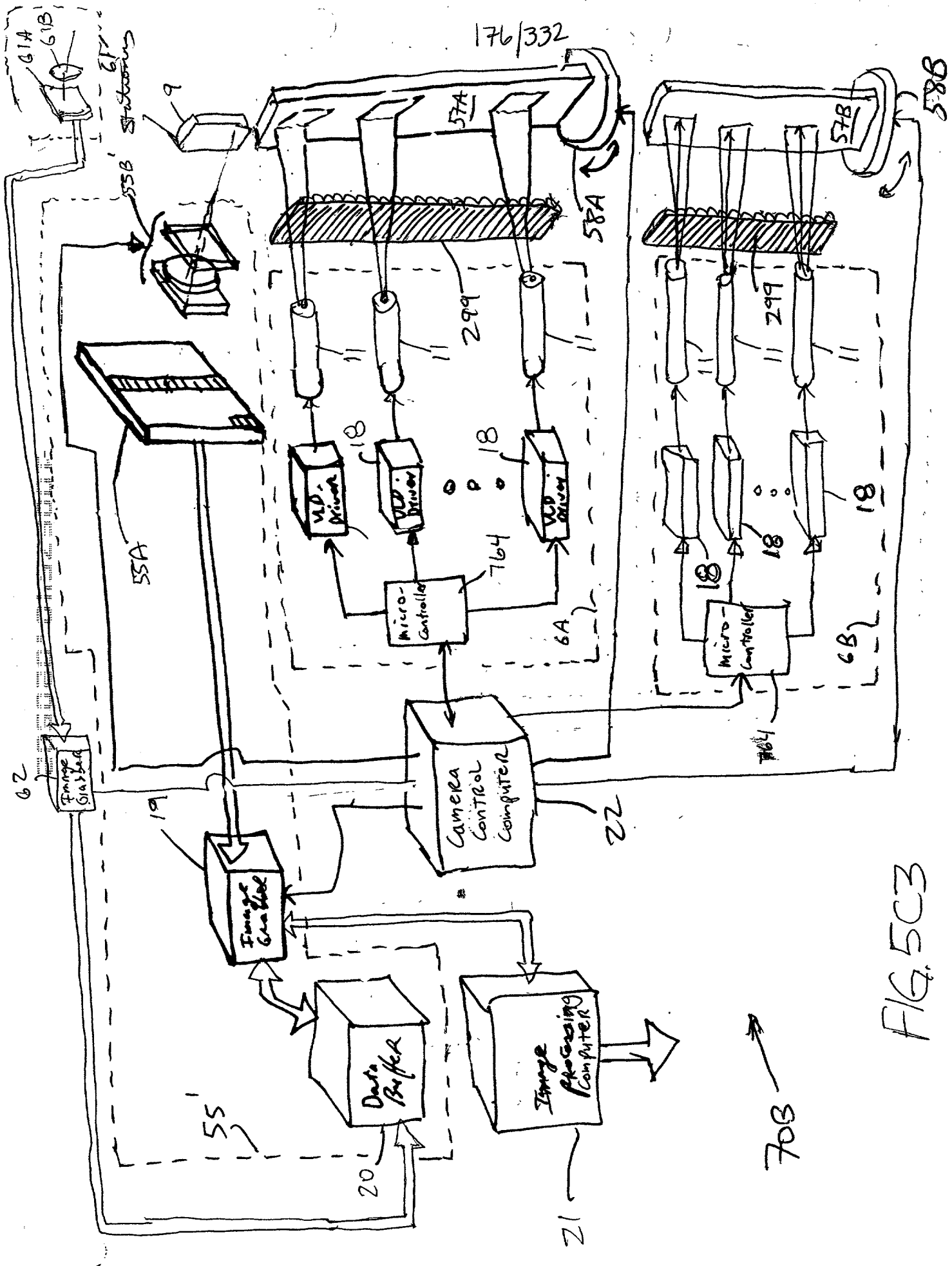


FIG. 5C3

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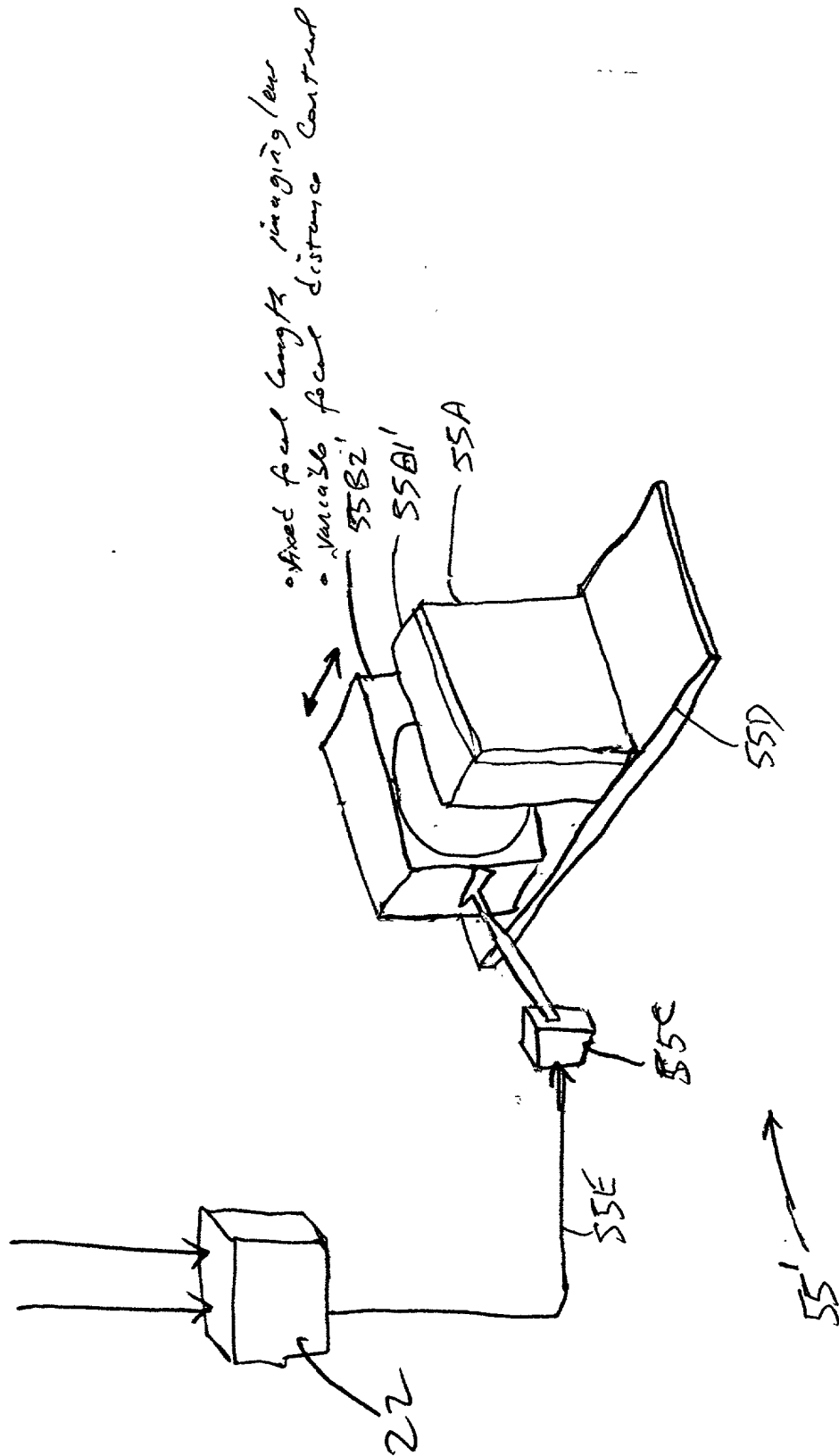


FIG. 5C4

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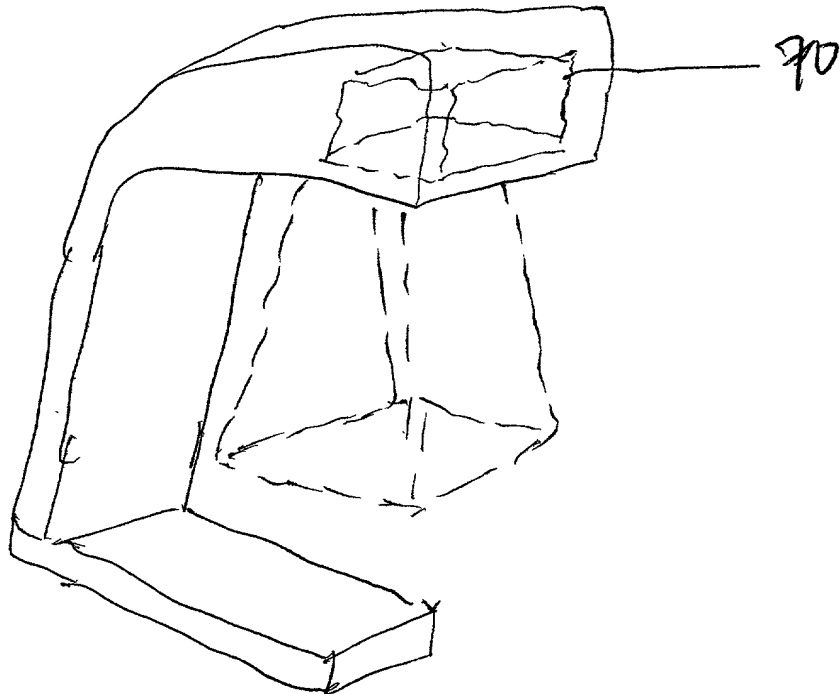


FIG. 5D

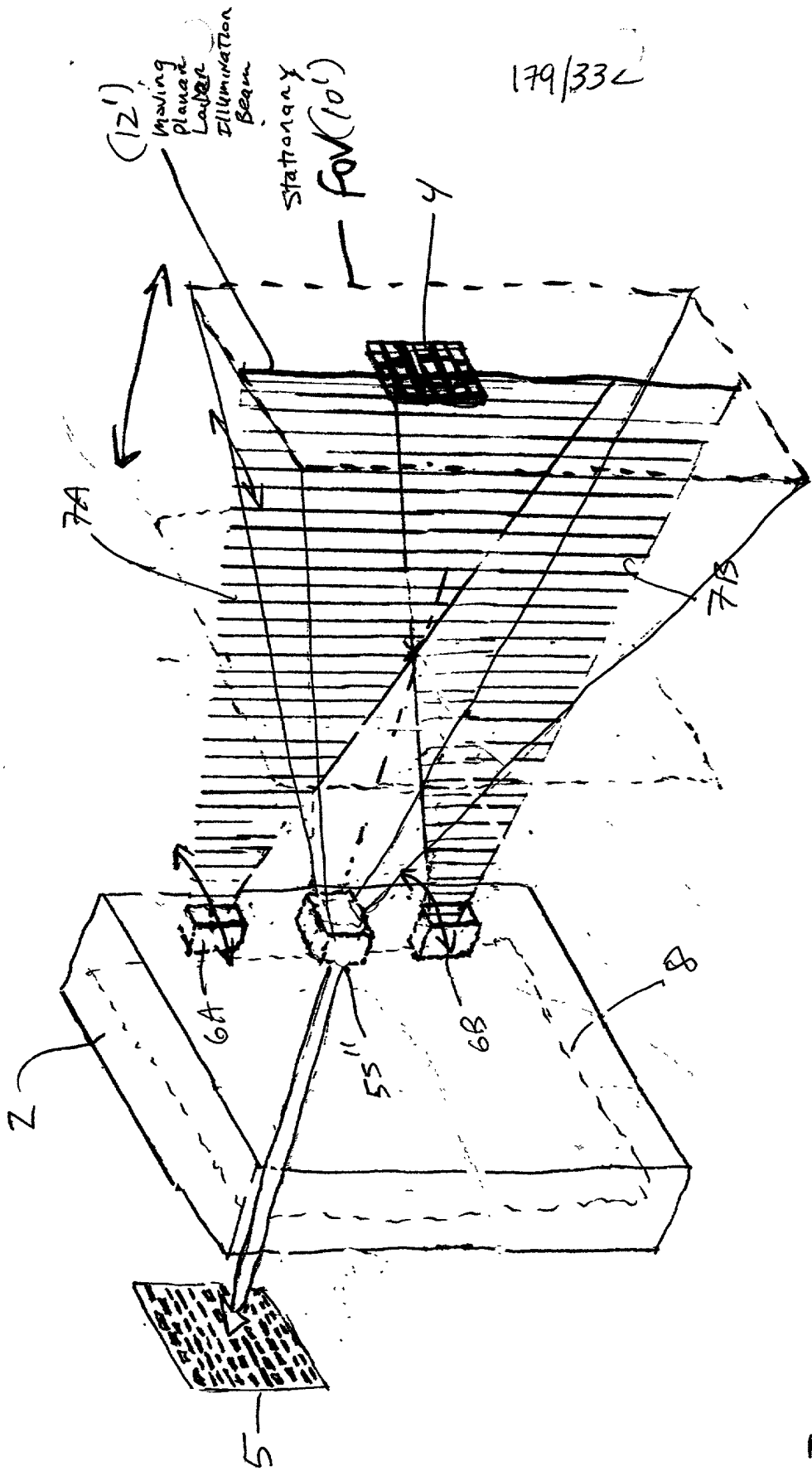
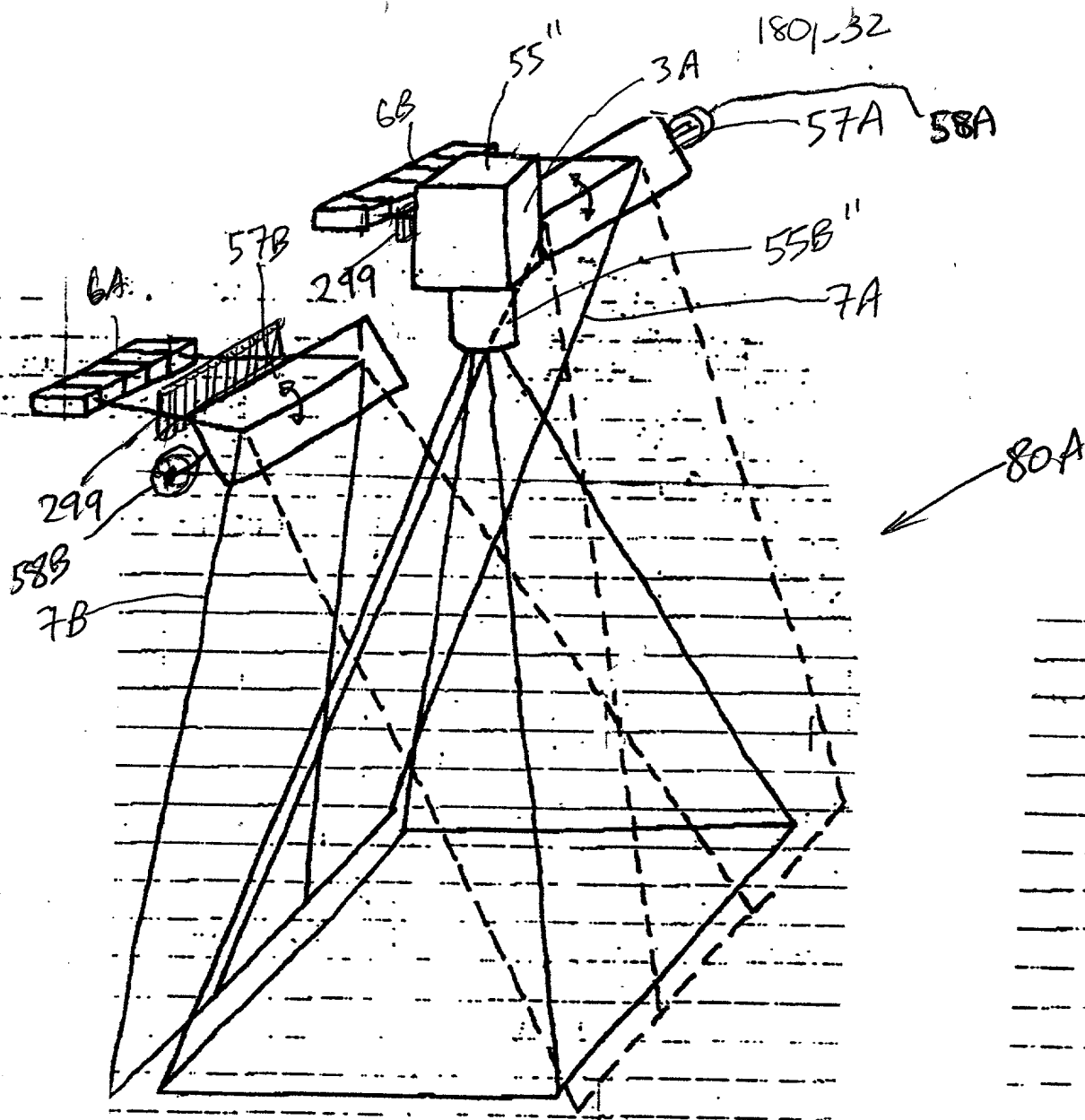


FIG. 6A

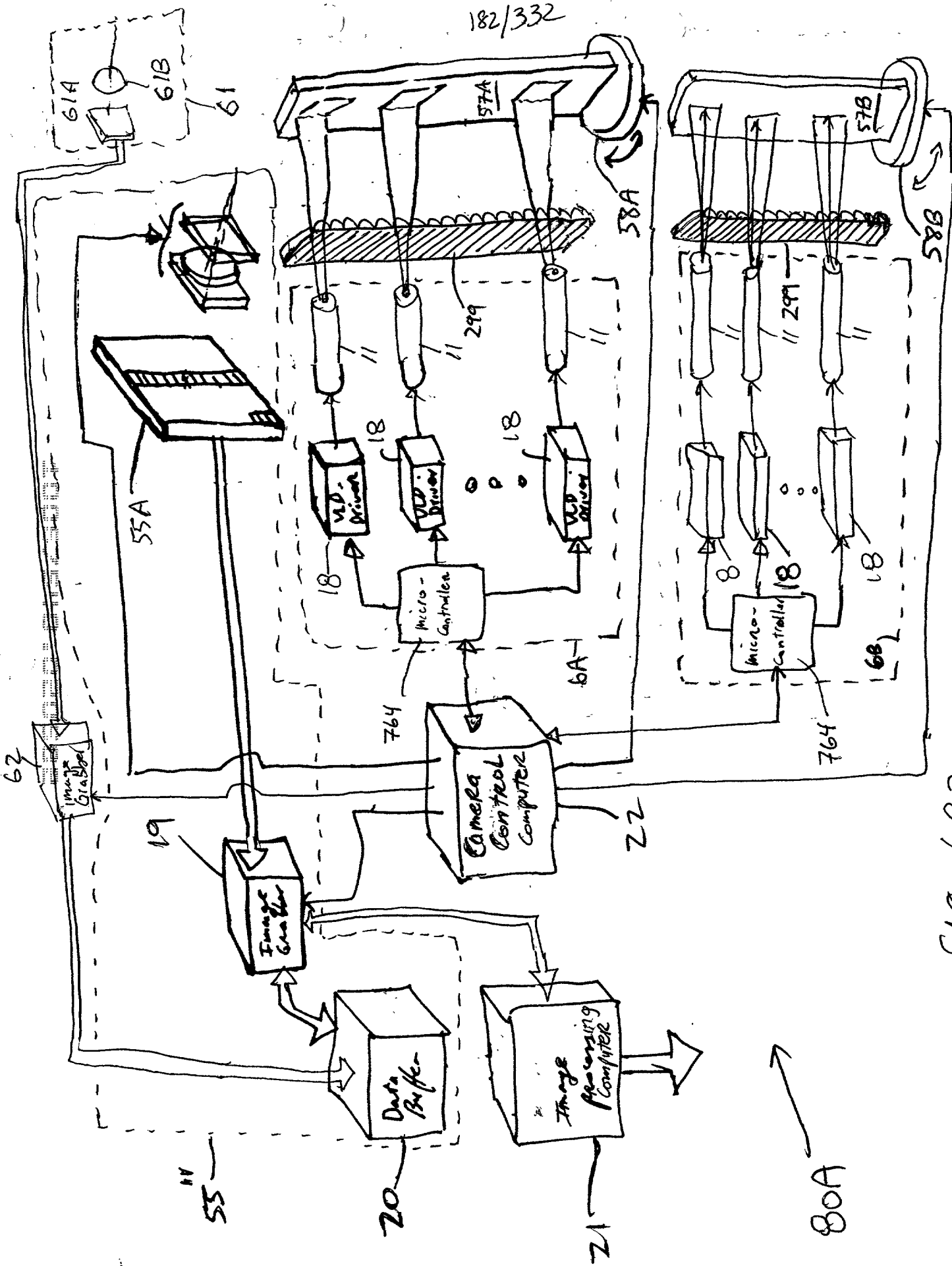
80



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FIG. 6B2



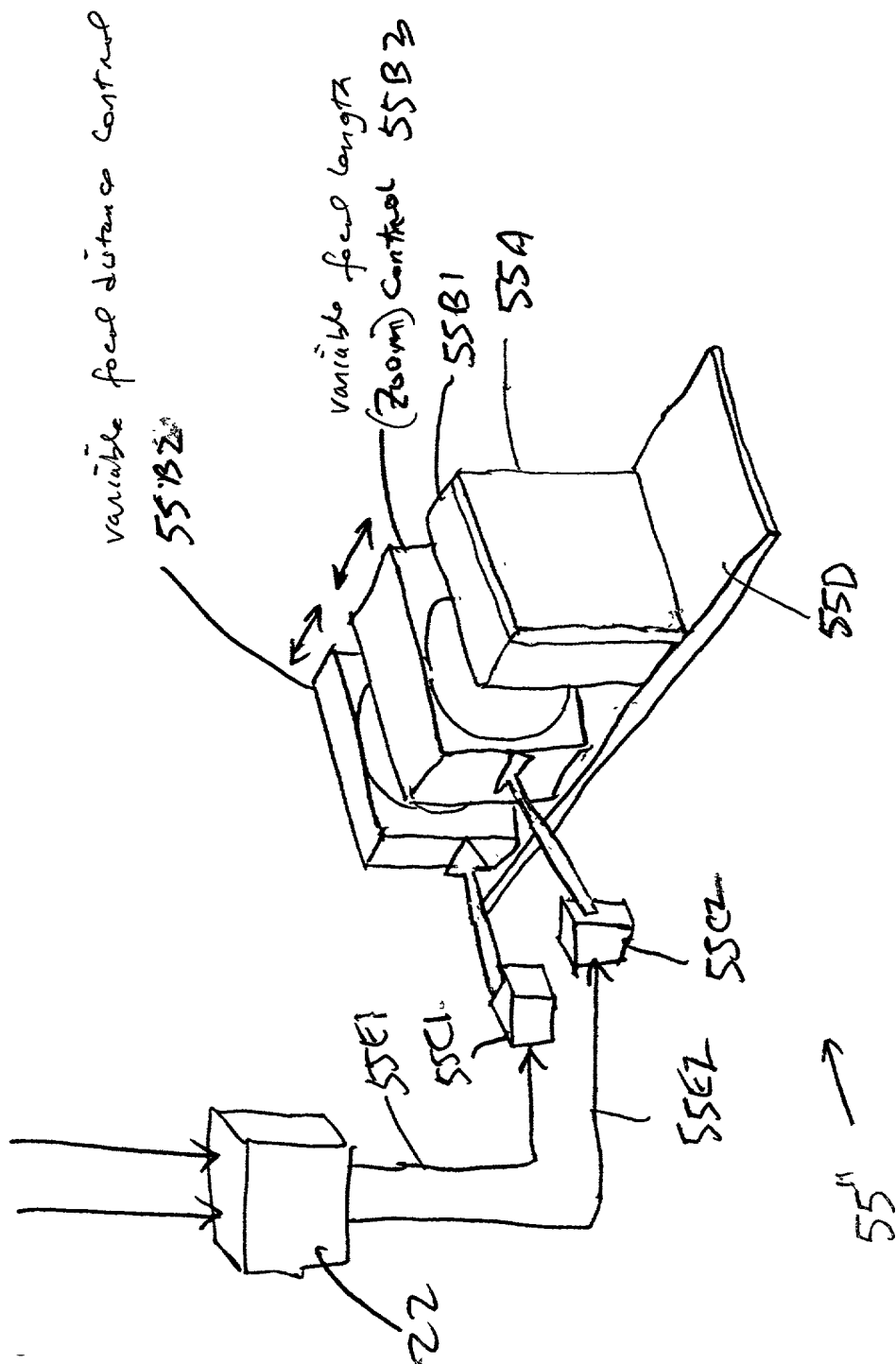


FIG. 6B4

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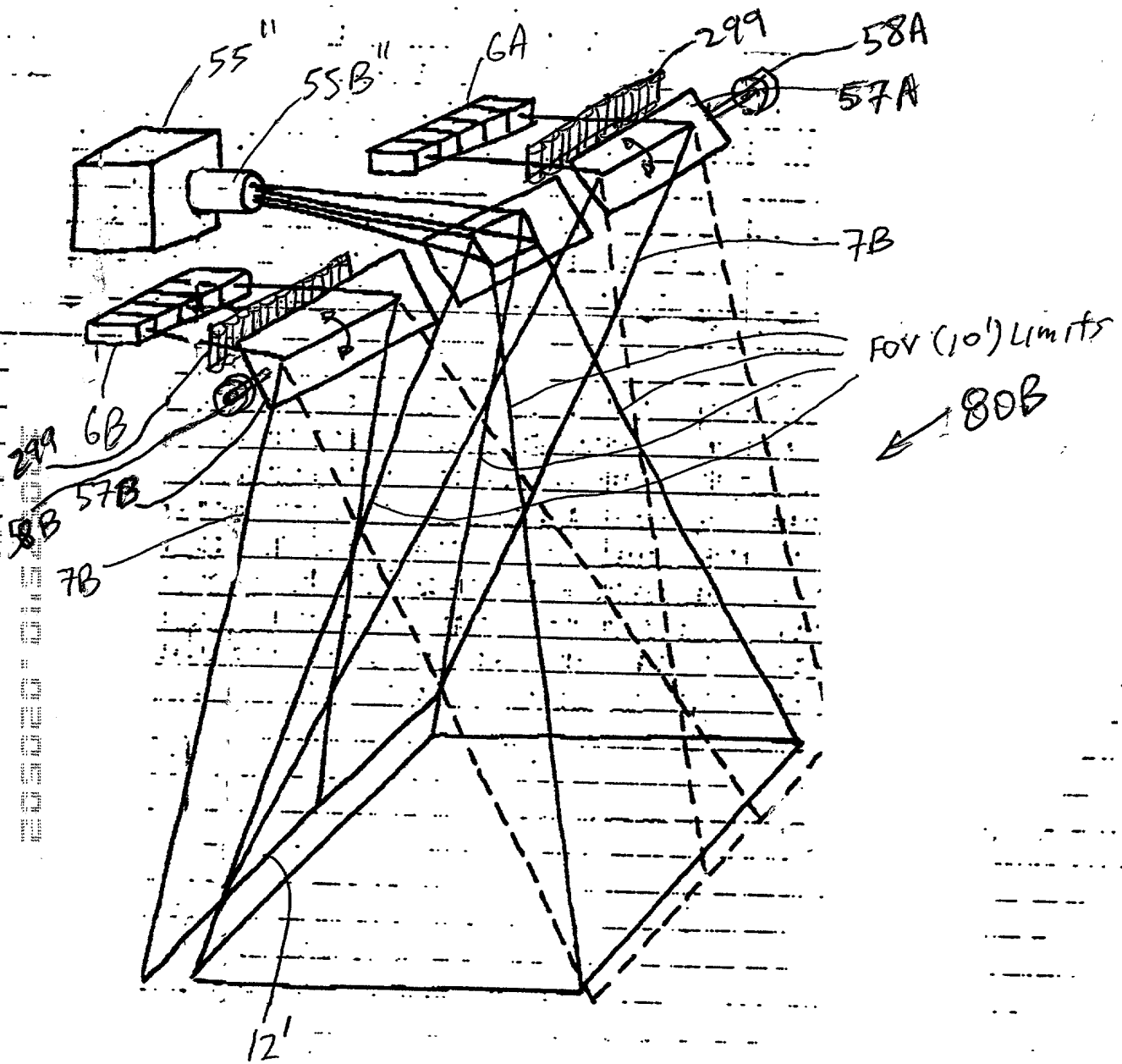
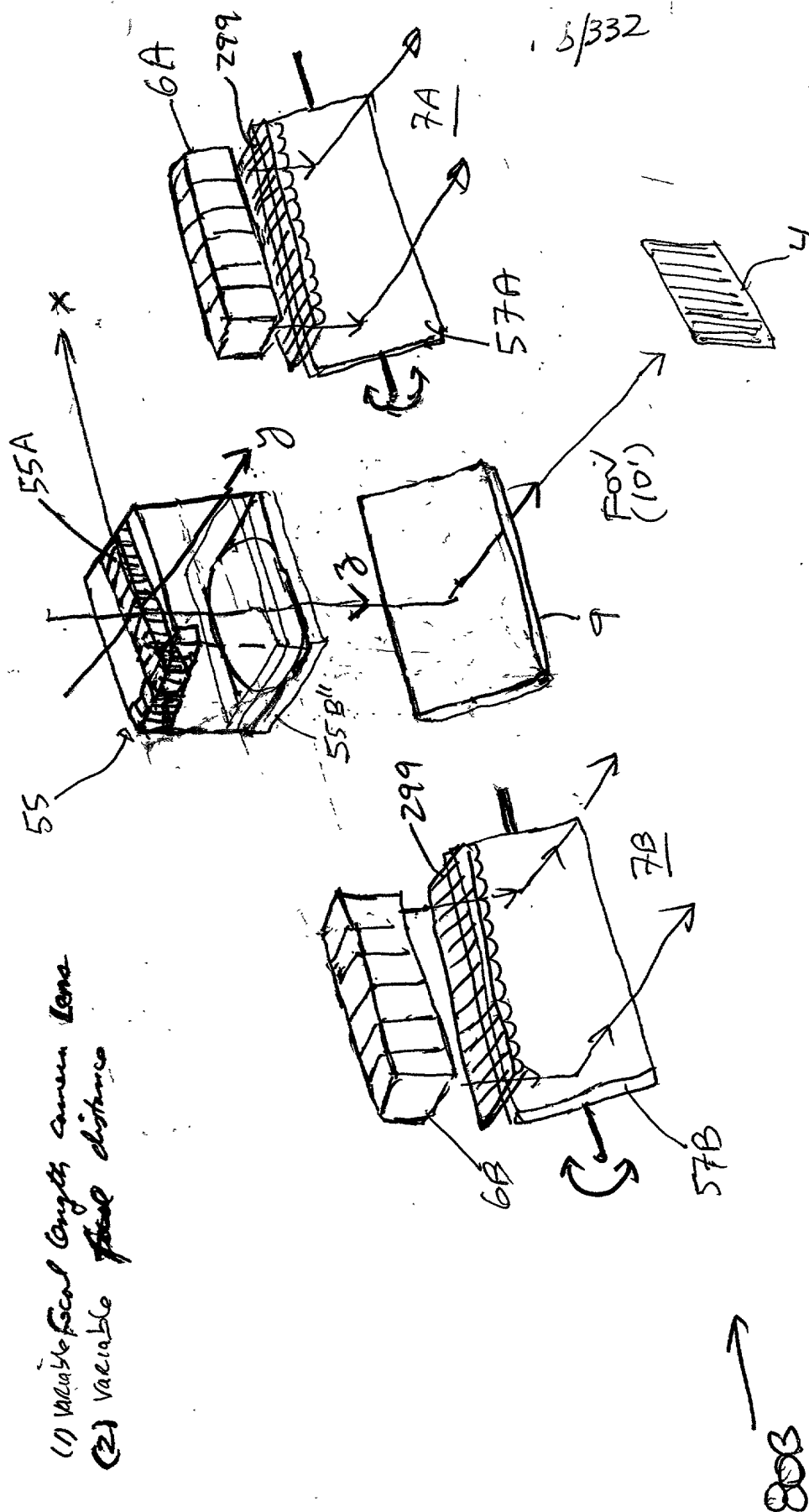
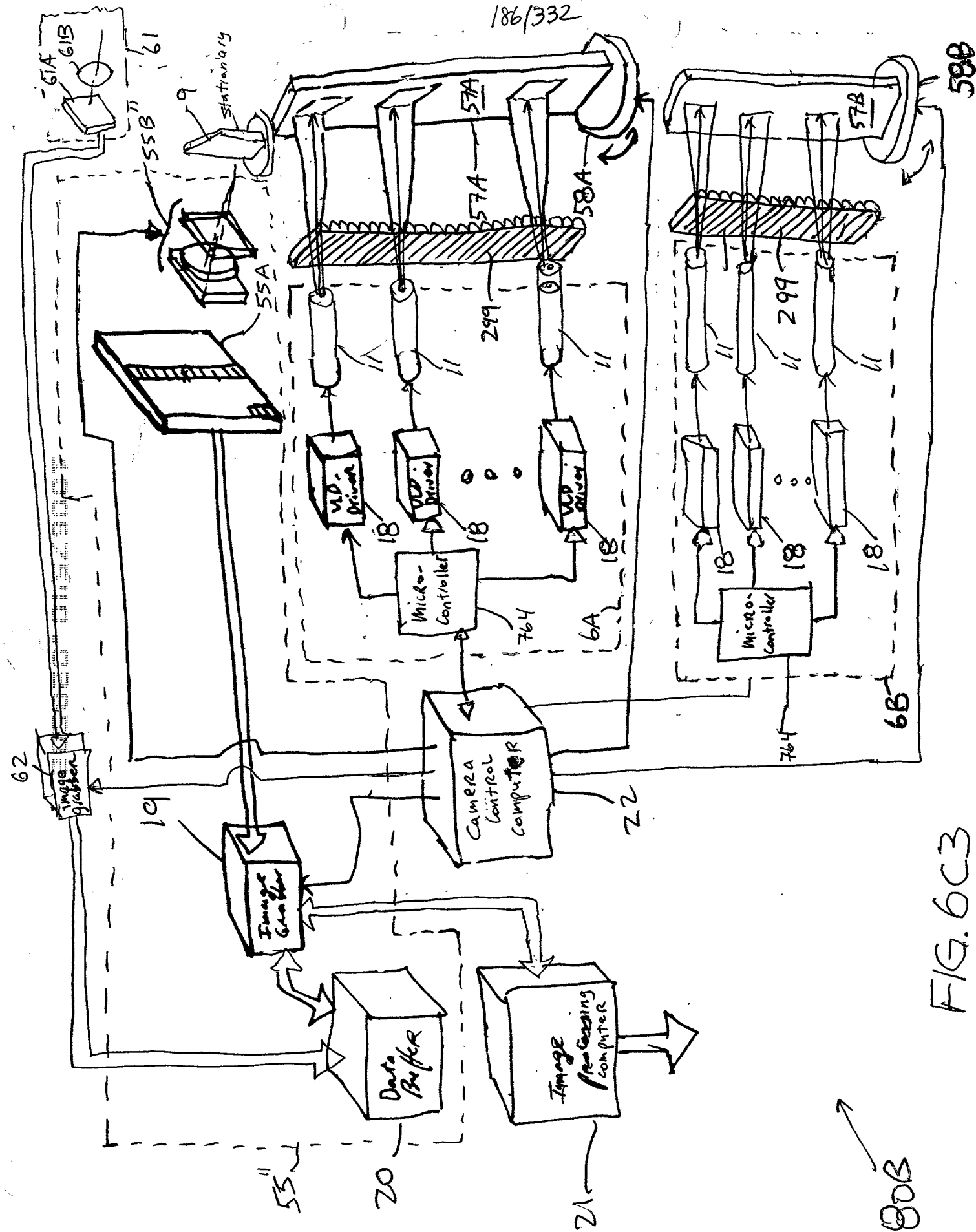


FIG. 6C1

- (1) Variable focal length camera lens
- (2) Variable focal distance





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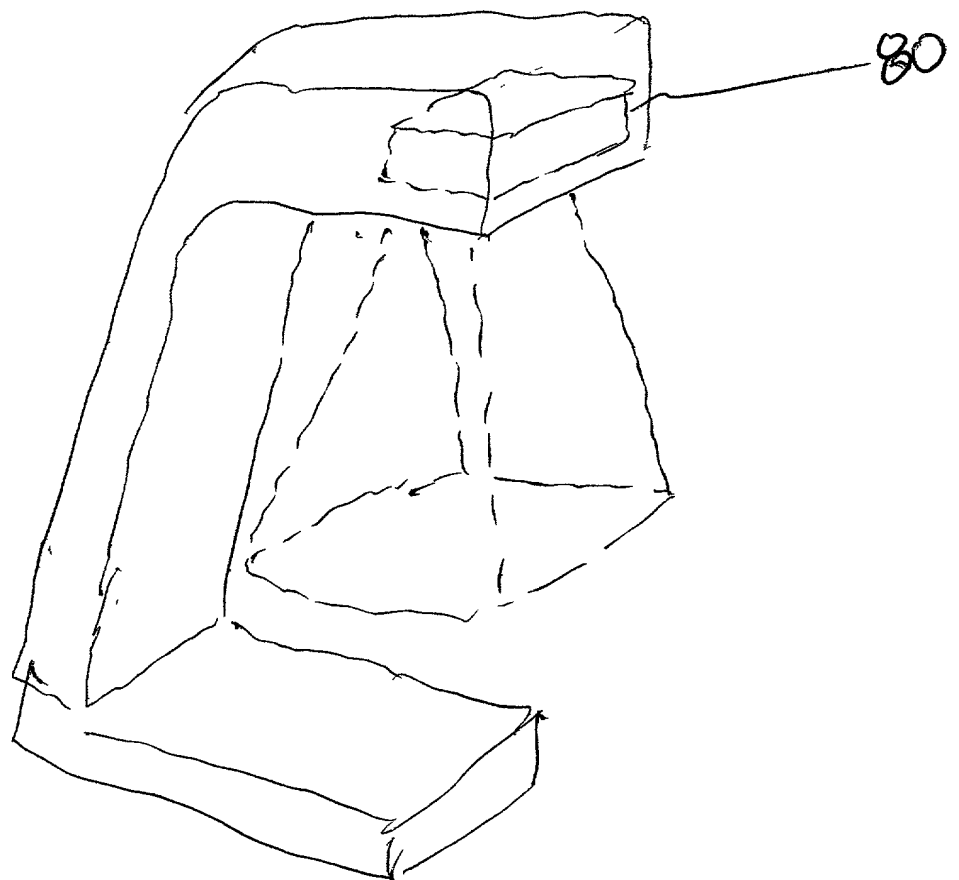


FIG. 6C5

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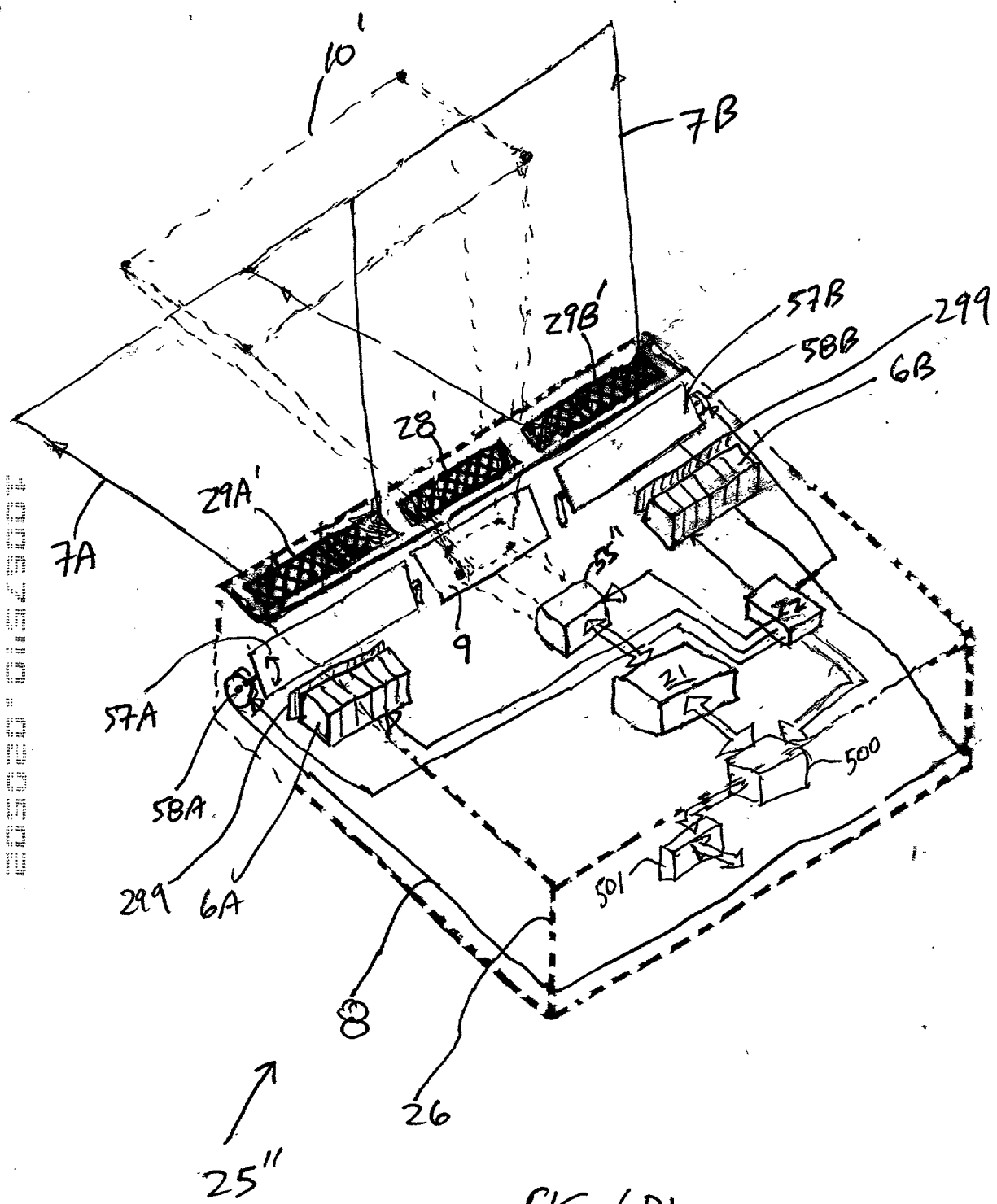


FIG. 6D1

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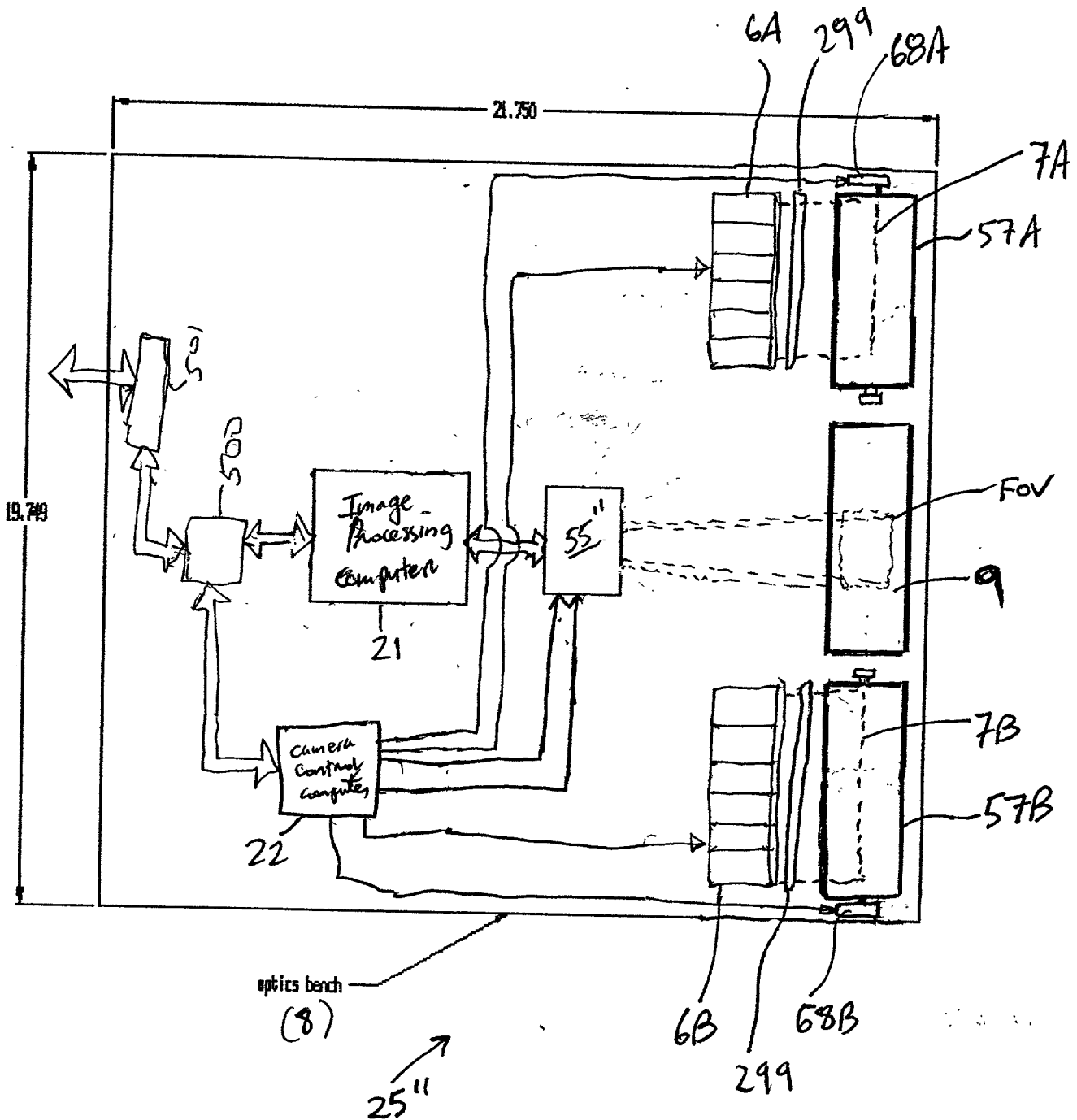


FIG. 6DZ

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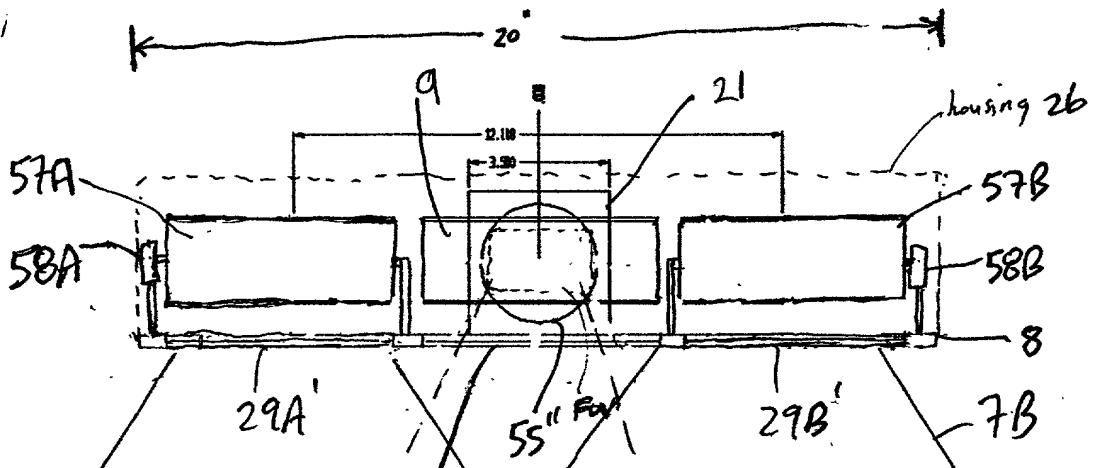


FIG. 6D3

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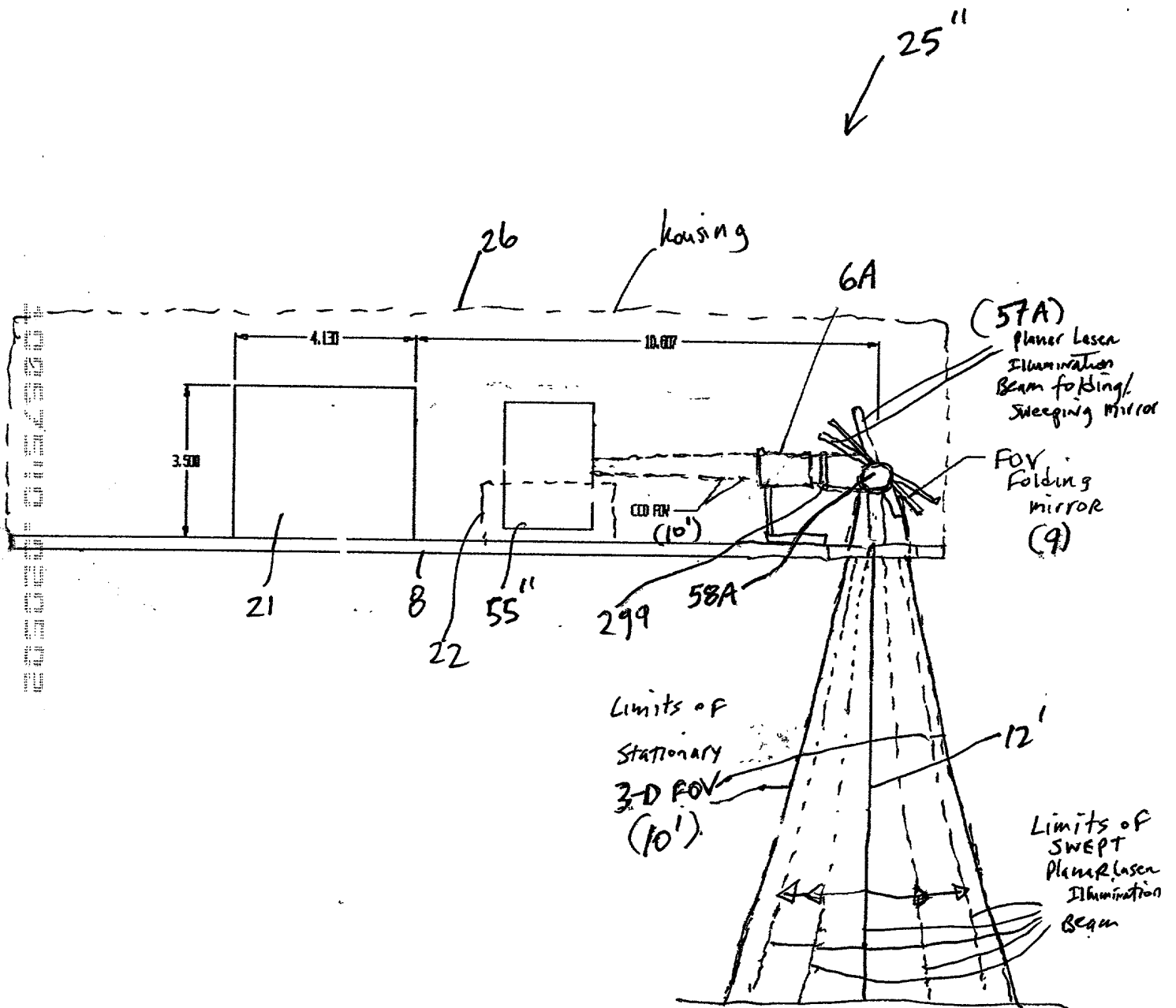


FIG. 6D4

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variable FOV

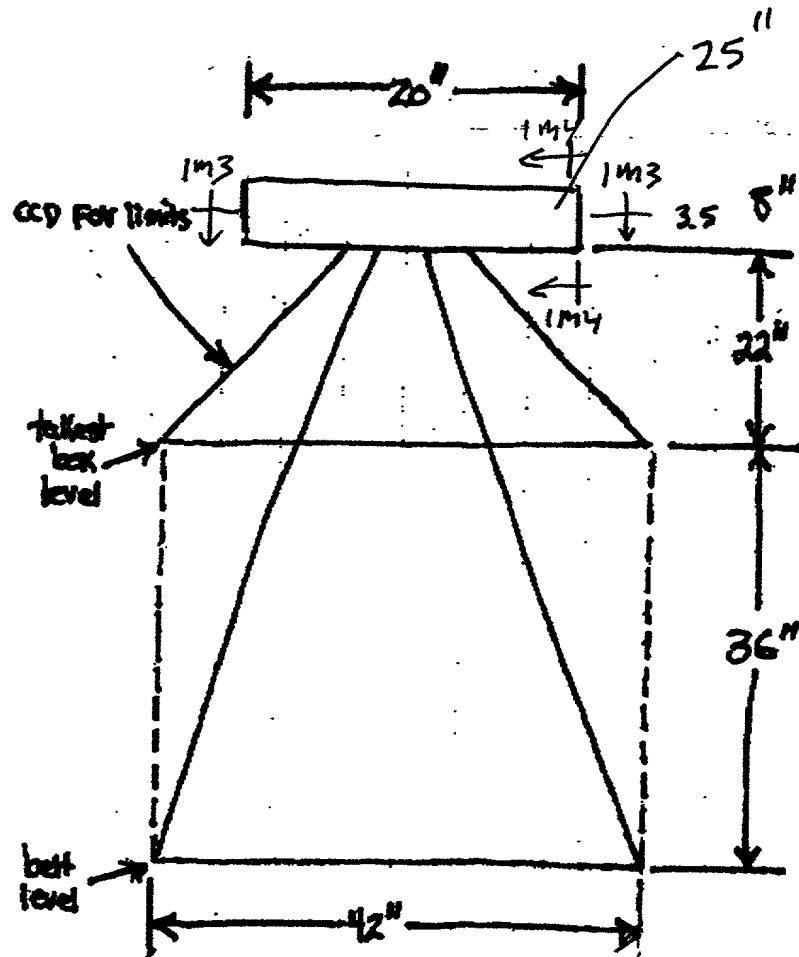


FIG. 6D5

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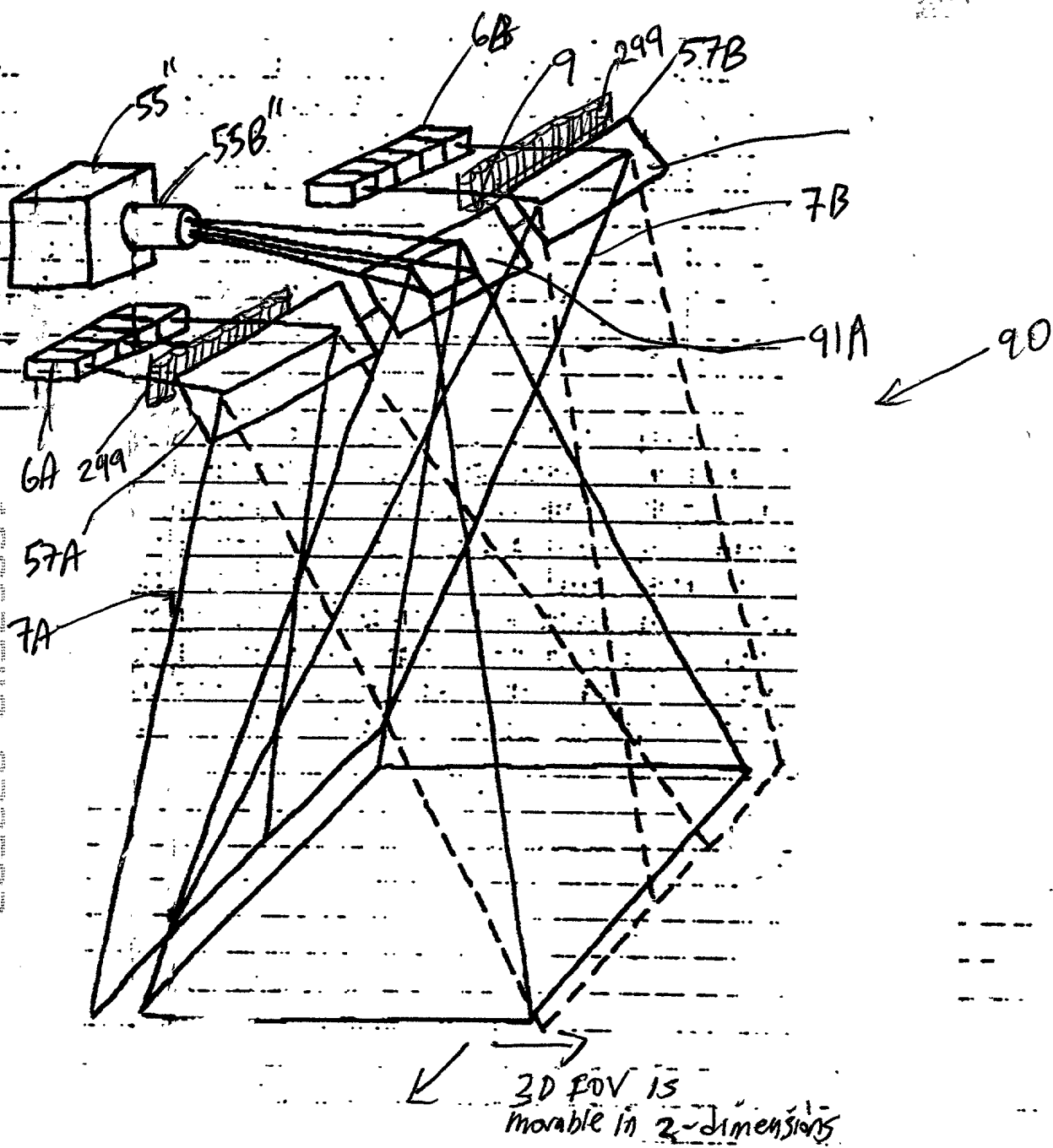
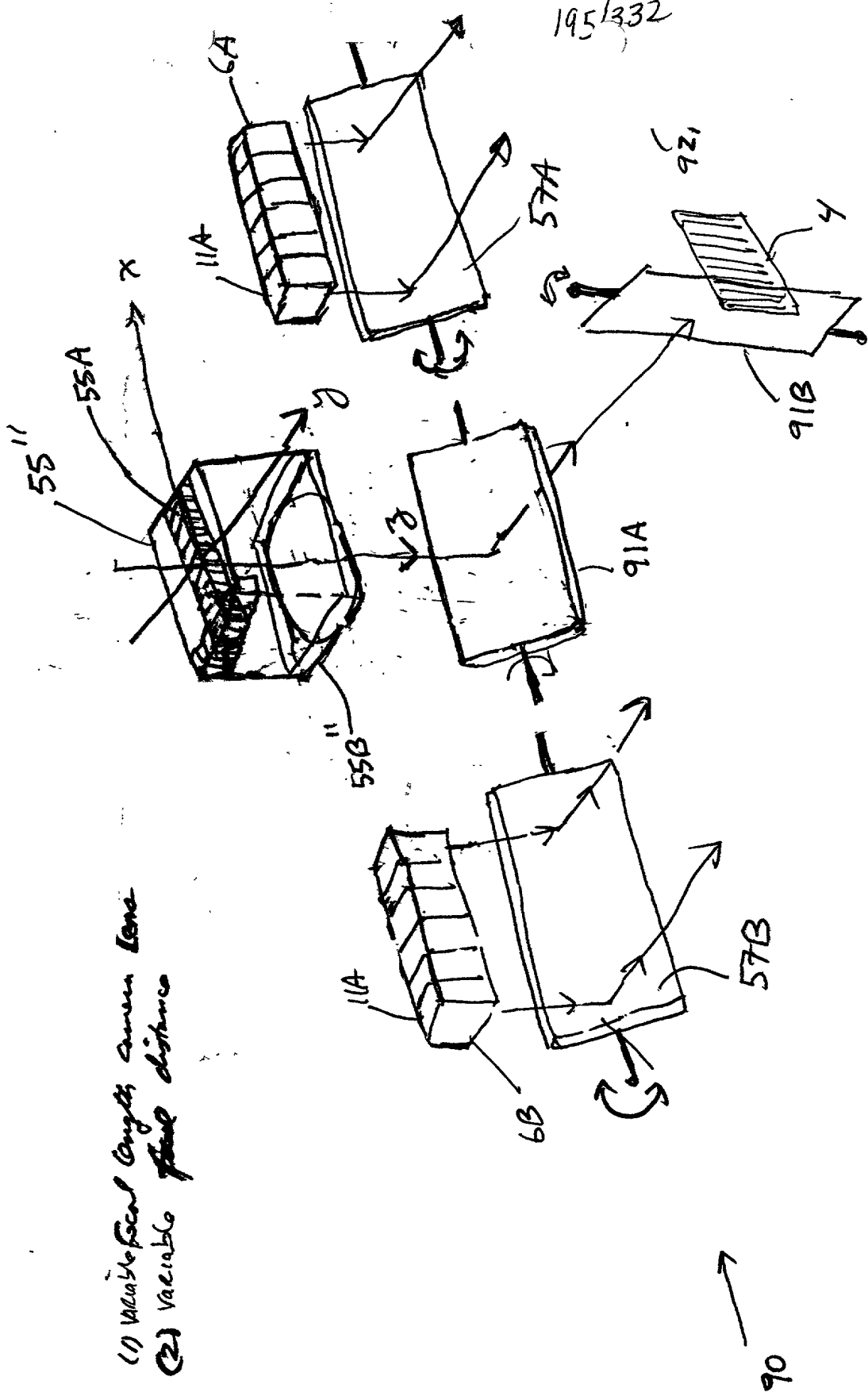


FIG 6E1

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(1) Variable focal length camera lens
(2) Variable fluid distance

FIG. 6E2

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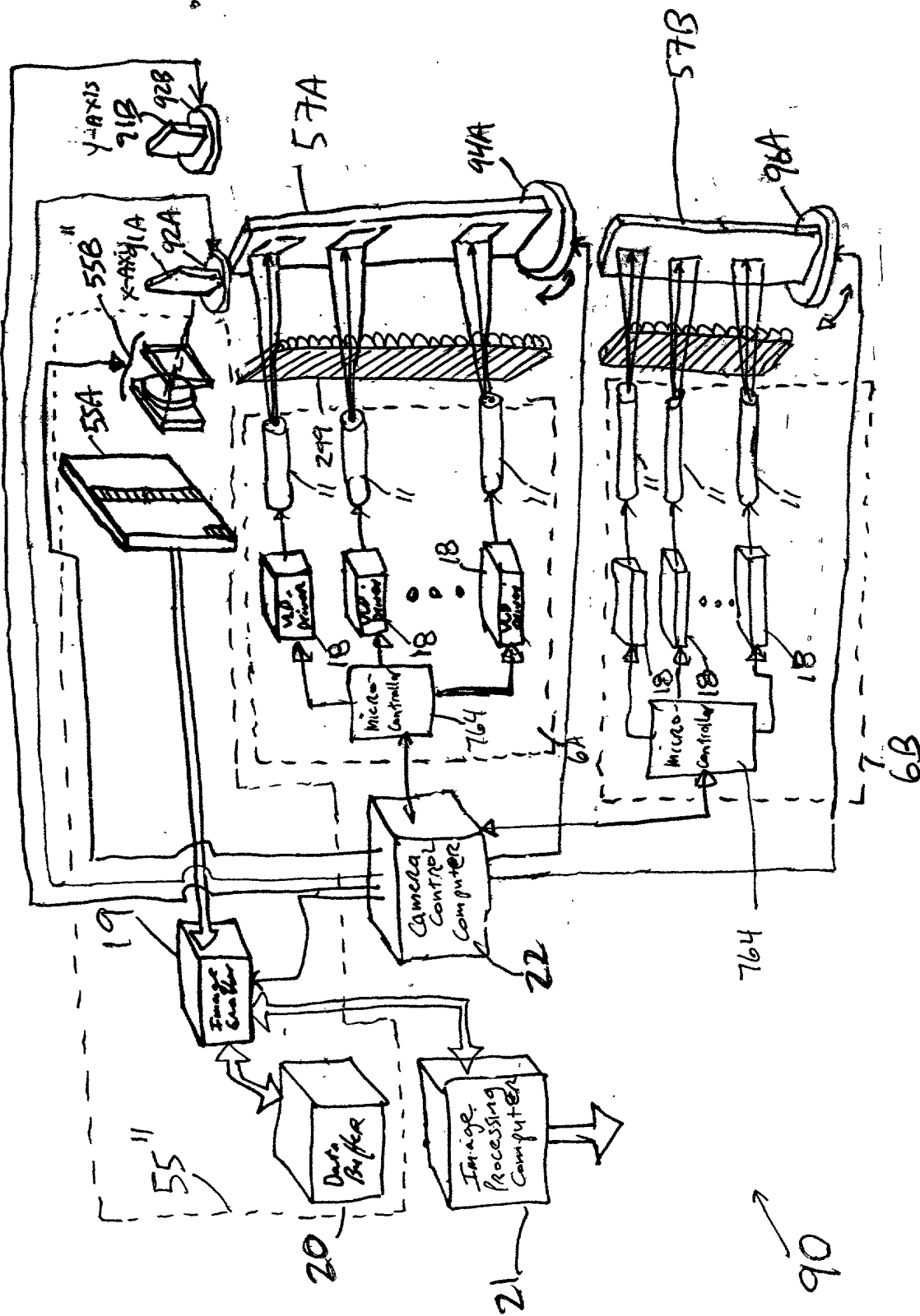


FIG. 6E3

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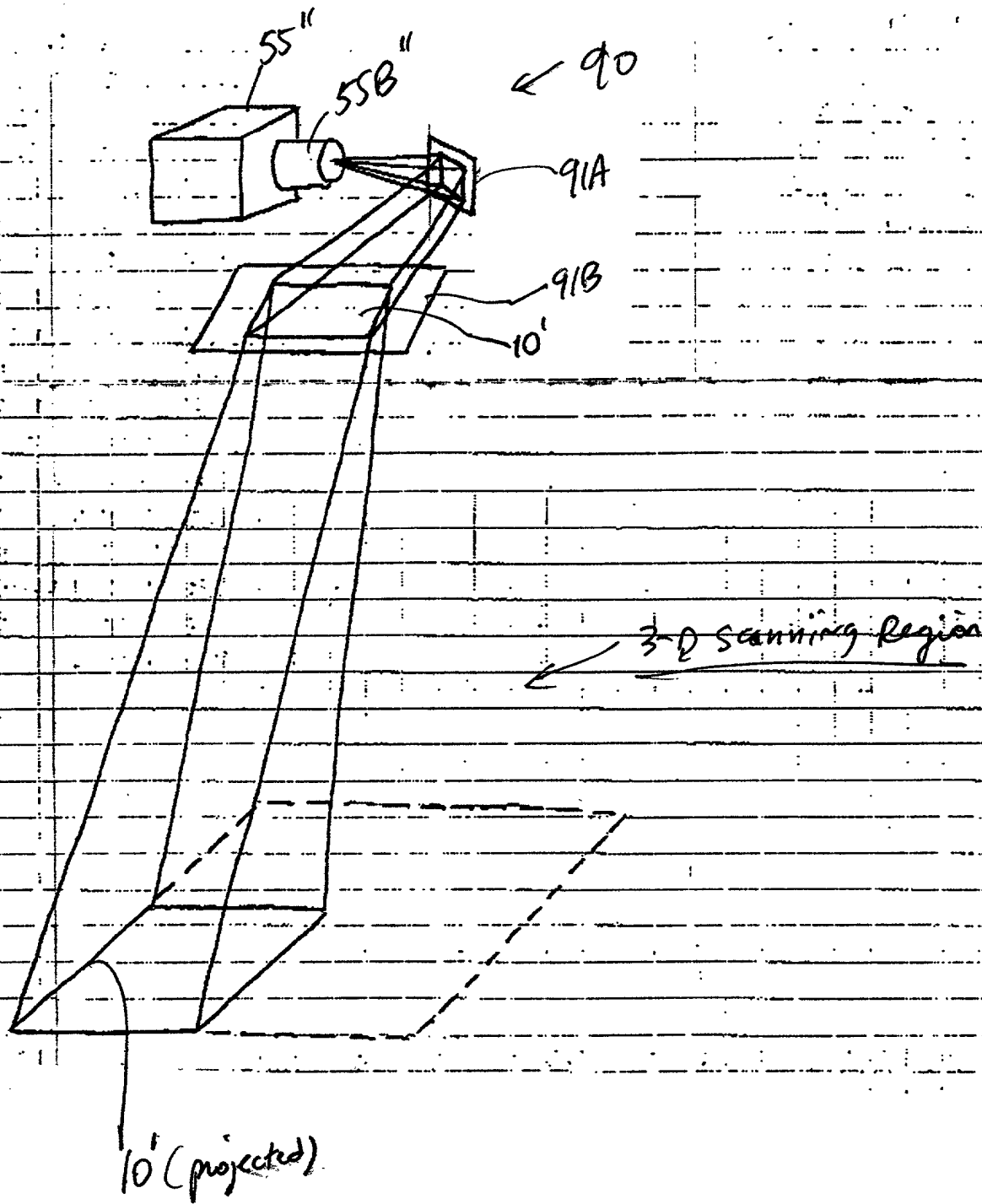


FIG. 6E4

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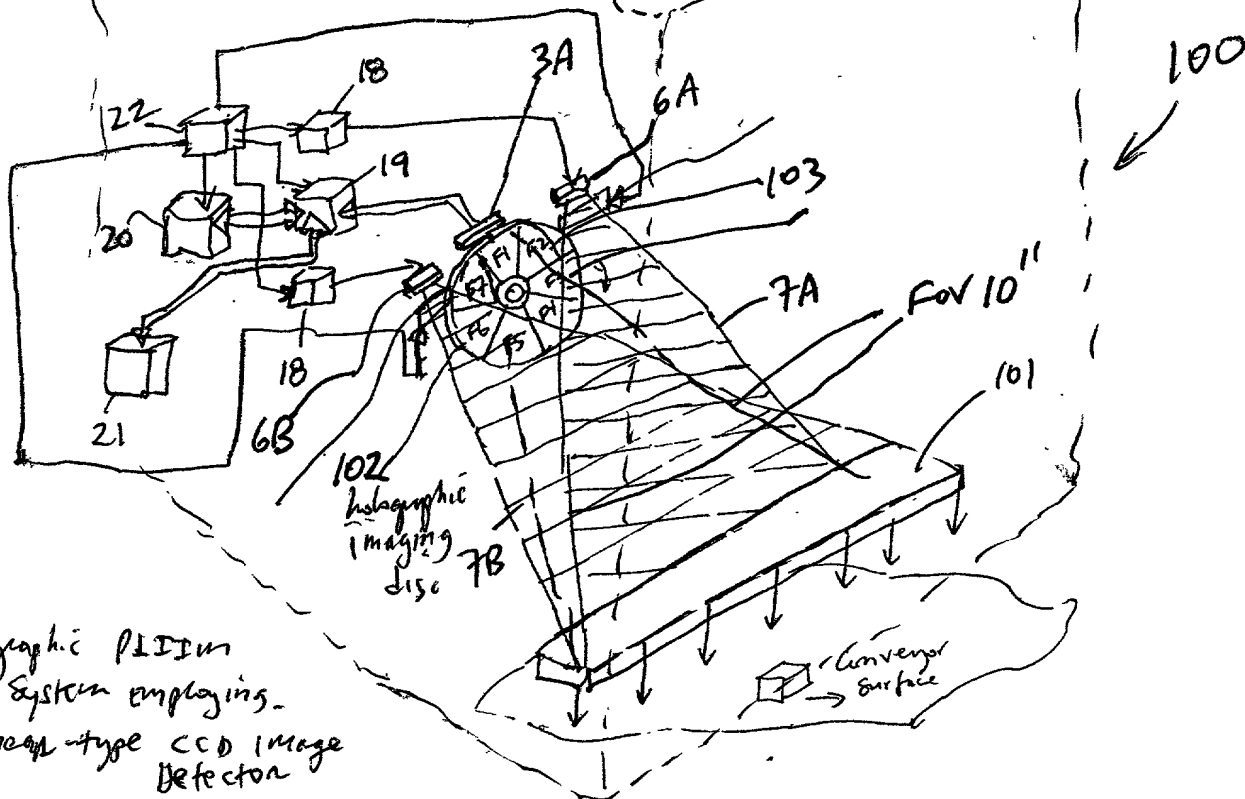


FIG. 7A

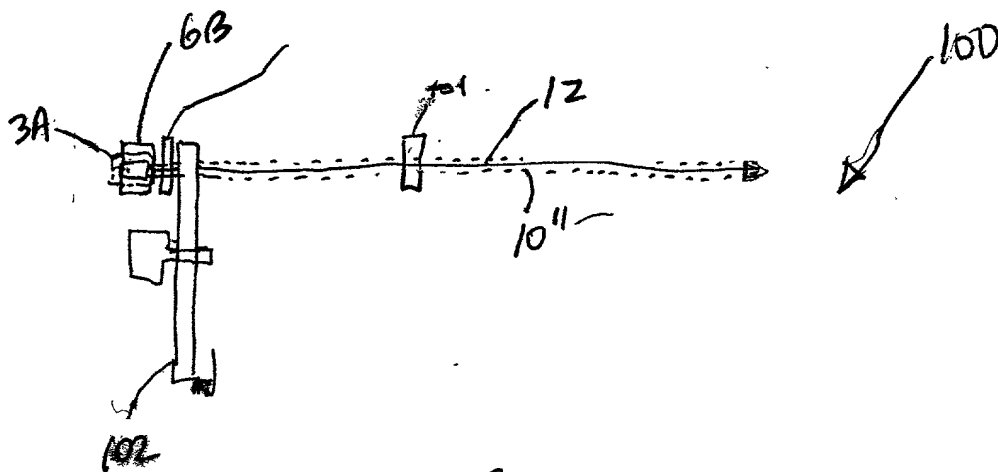


FIG. 7B

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

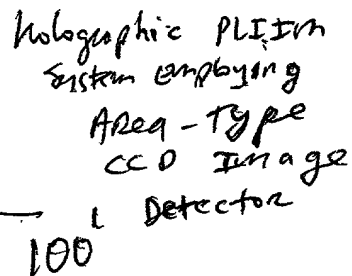
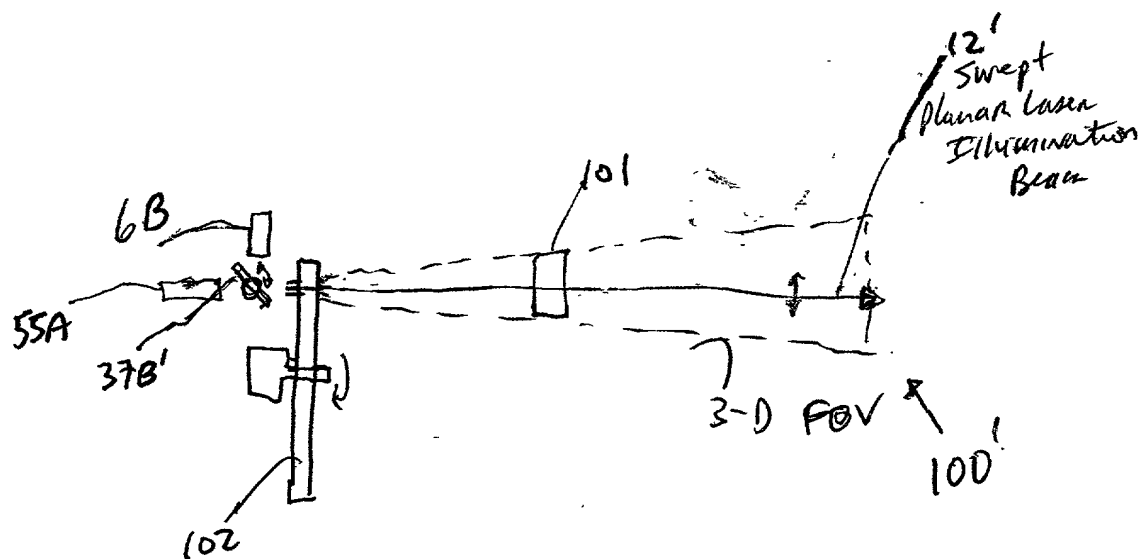


FIG. 8B



1-D CCD SCANNER EMBODIMENT

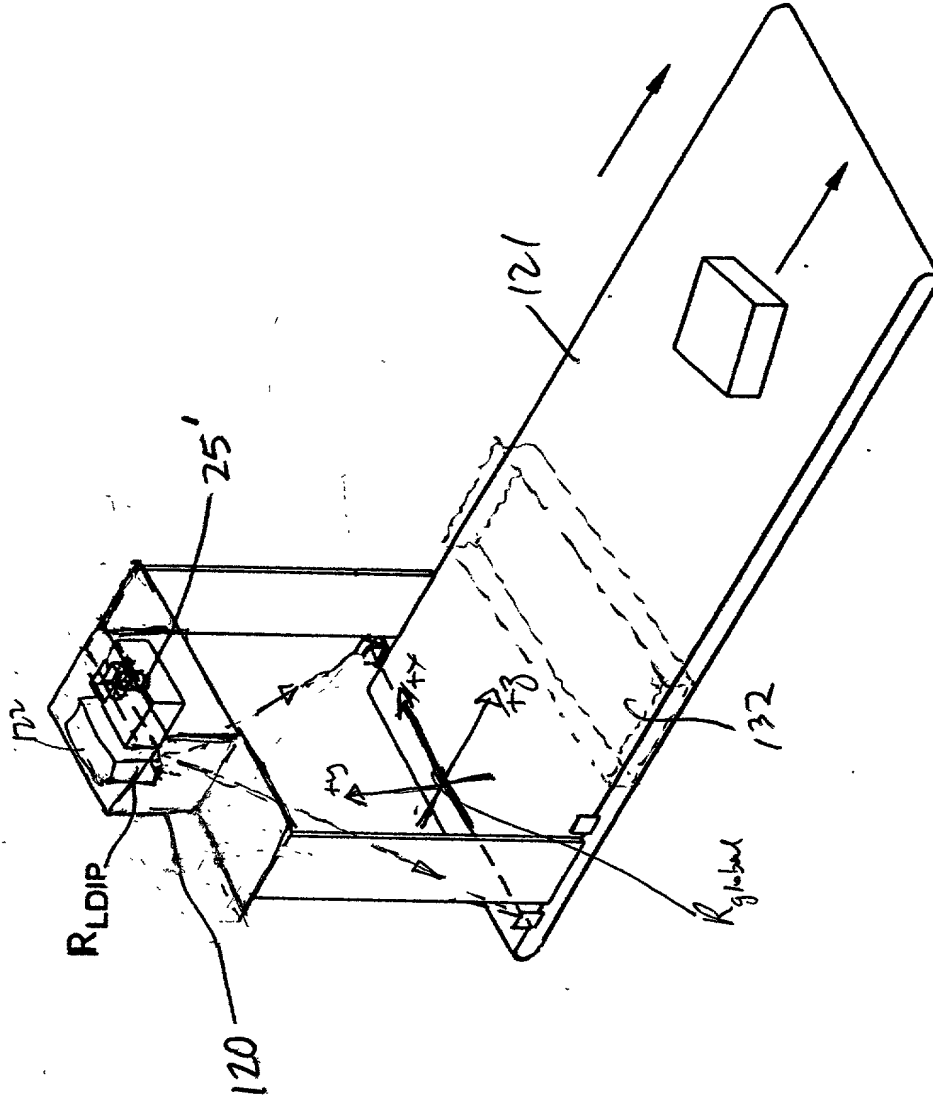


FIG. 9

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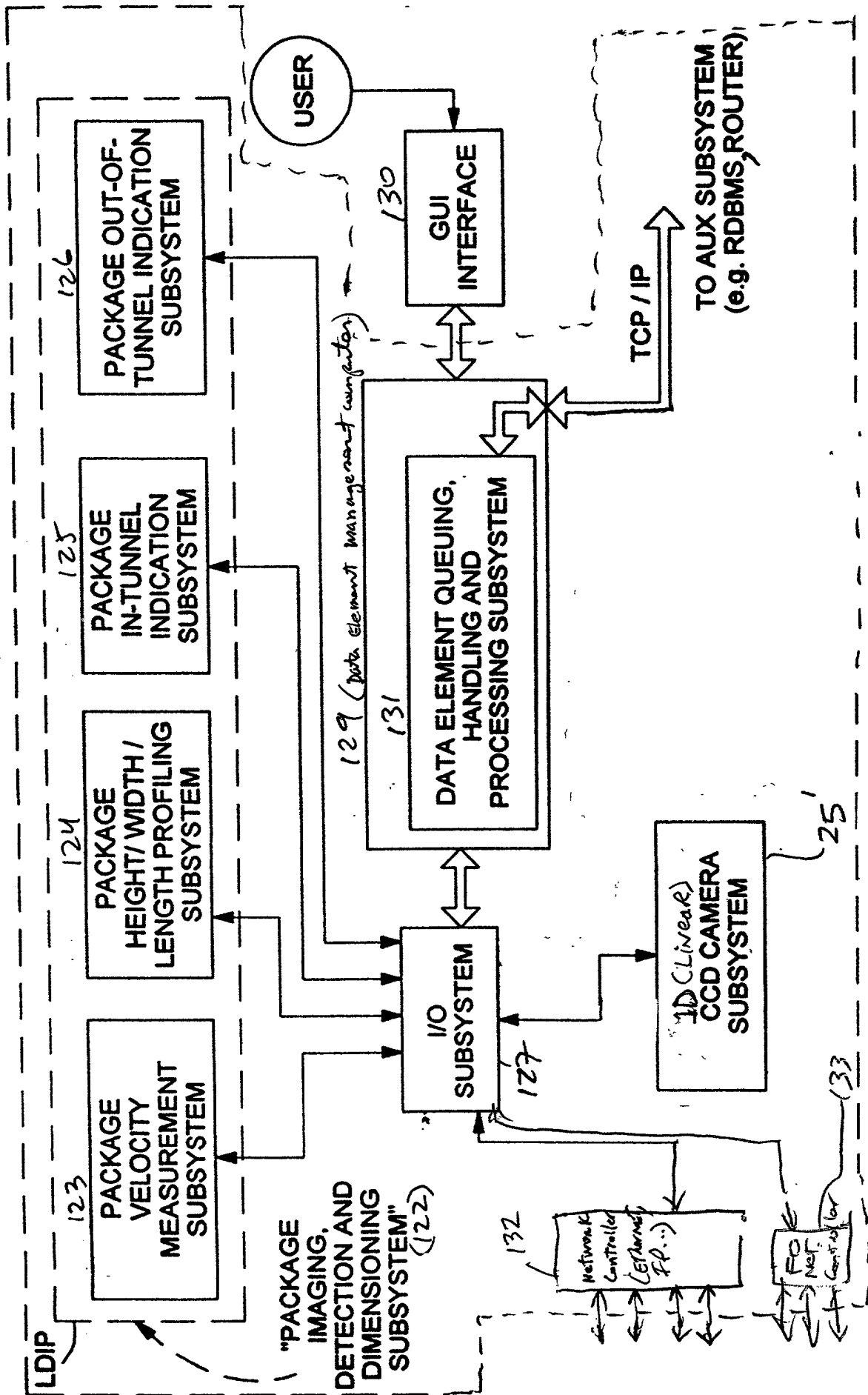


FIG. 10

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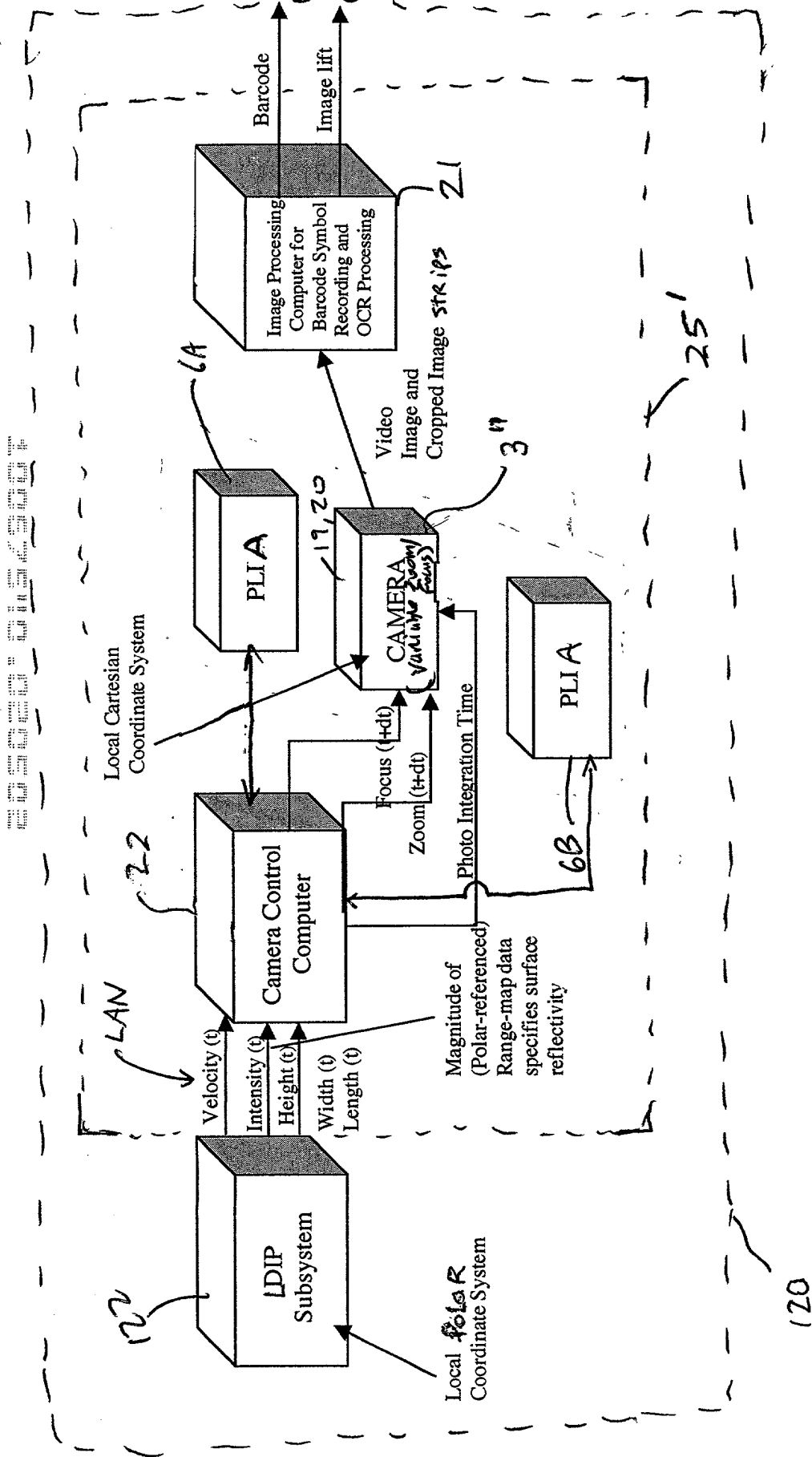


FIG. 11

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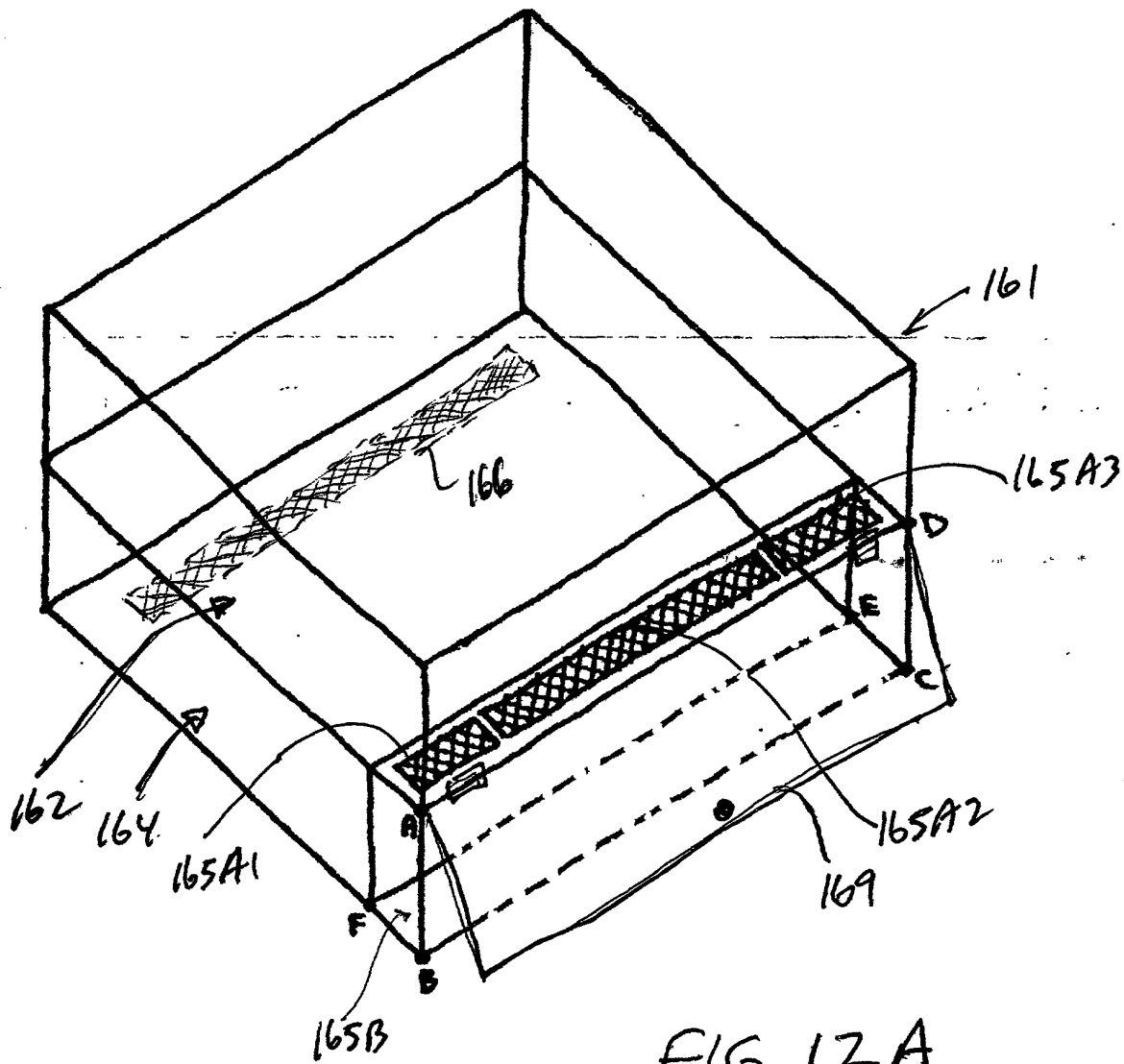


FIG. 12A

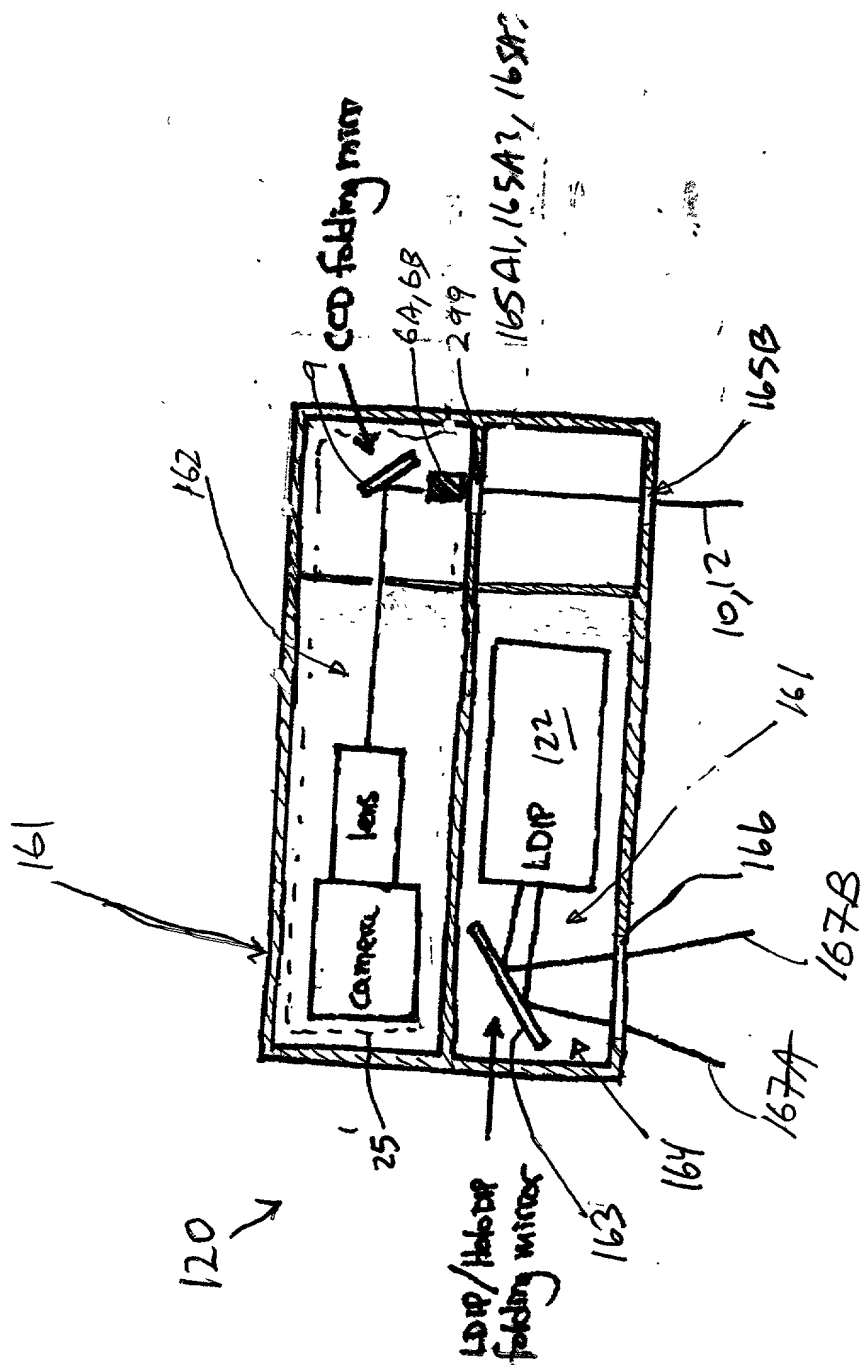


FIG. 12B

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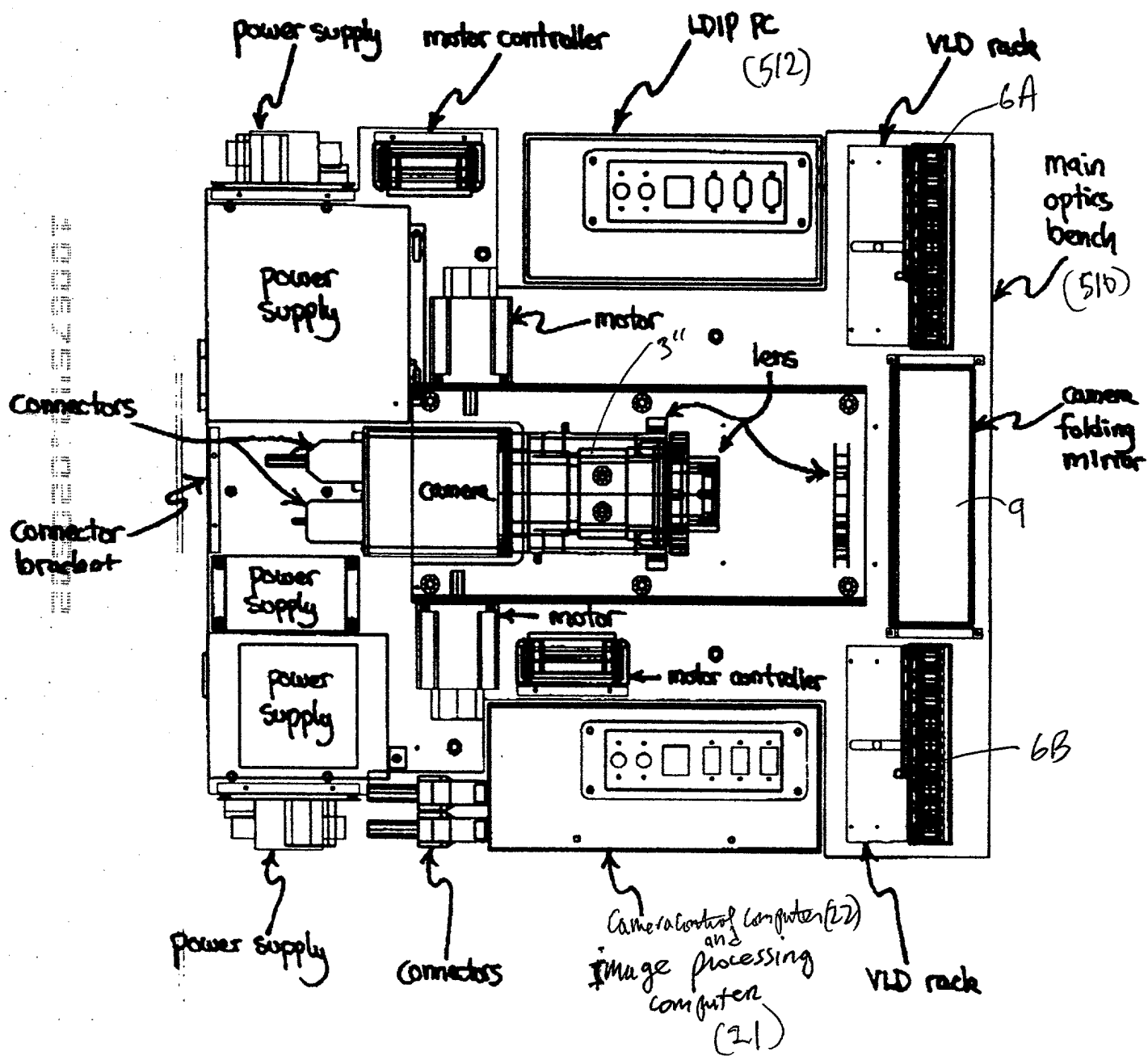


FIG. 12C

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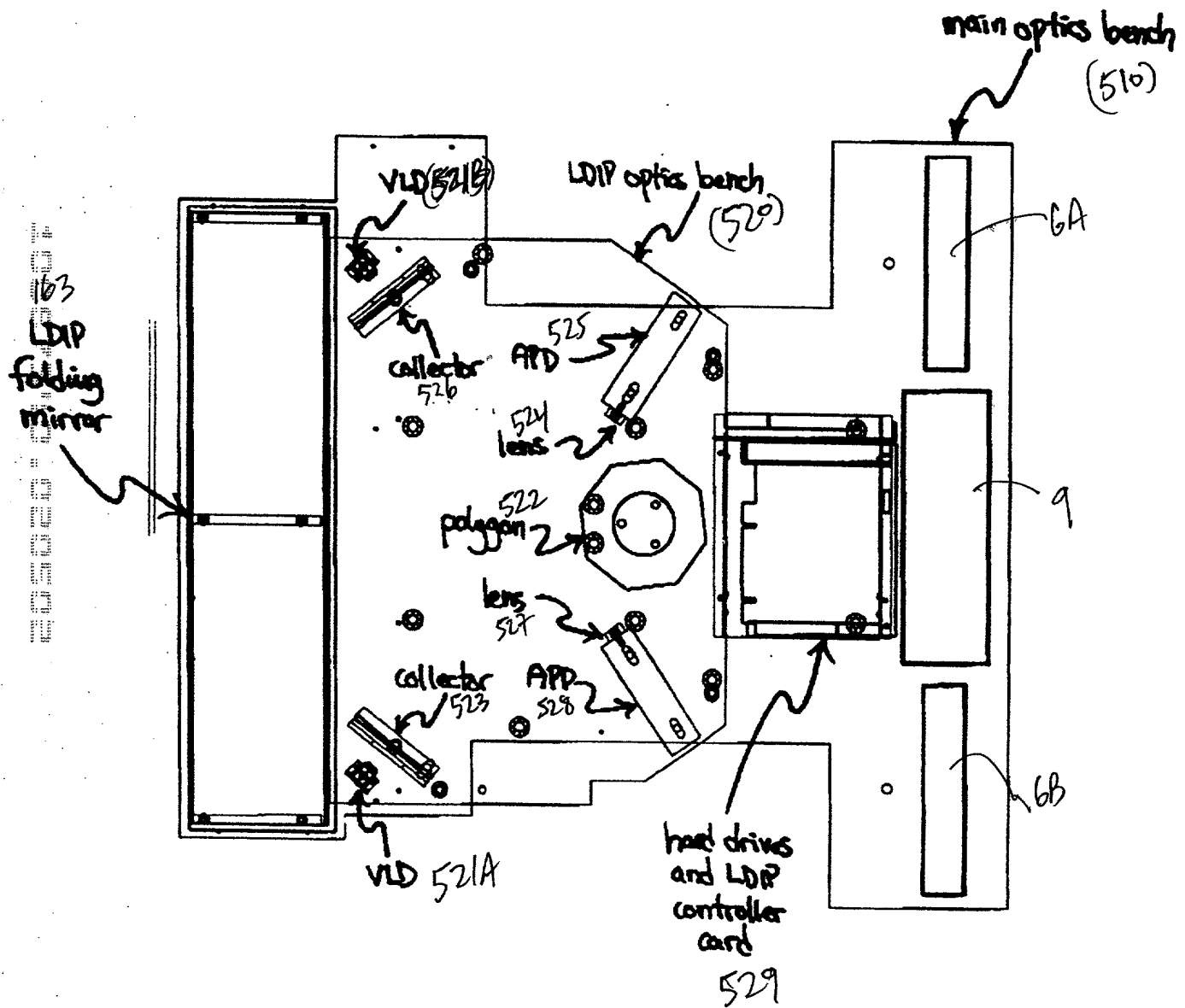
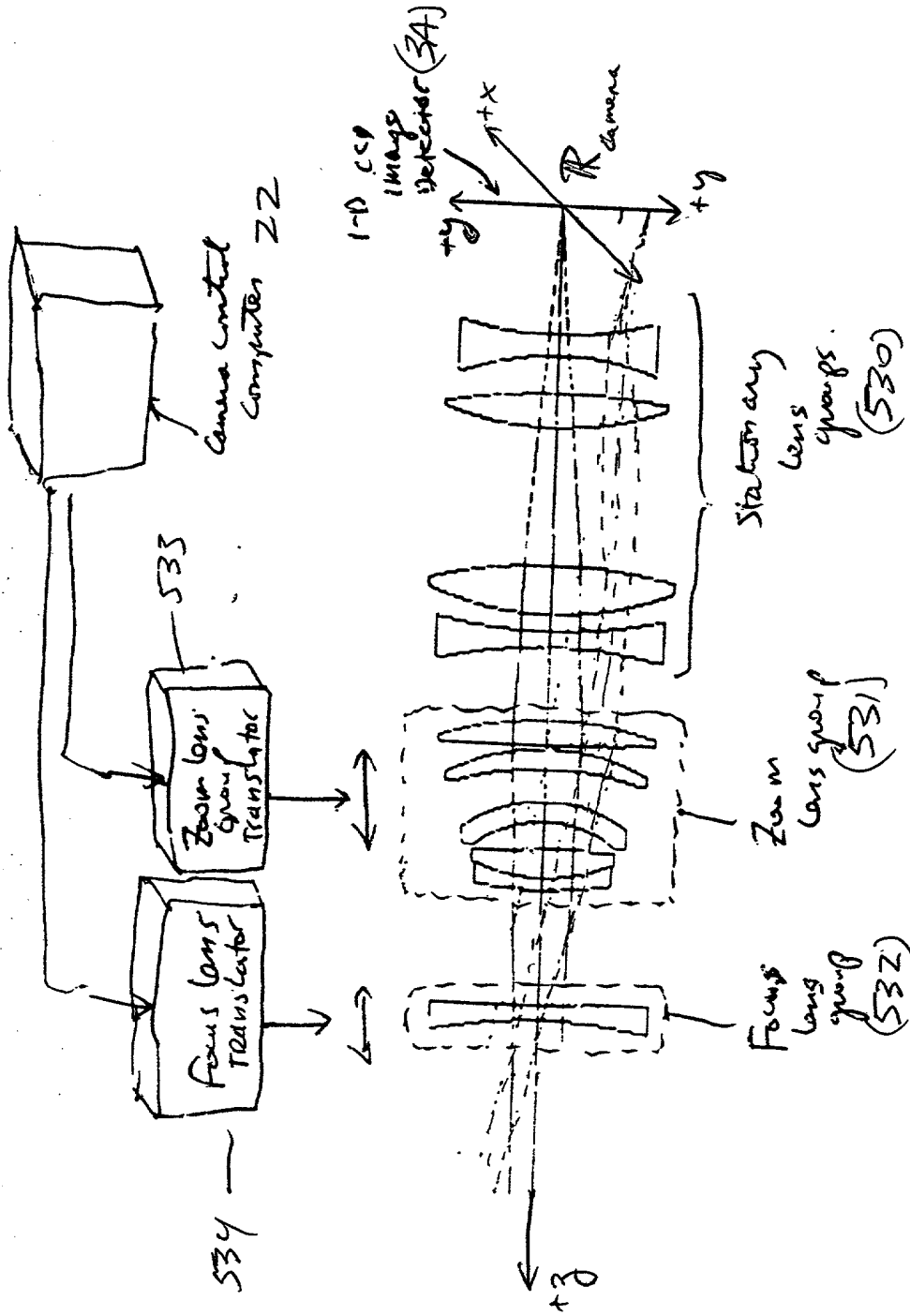


FIG 12D

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(main optics)
(Lens groups)

FIG. 12E

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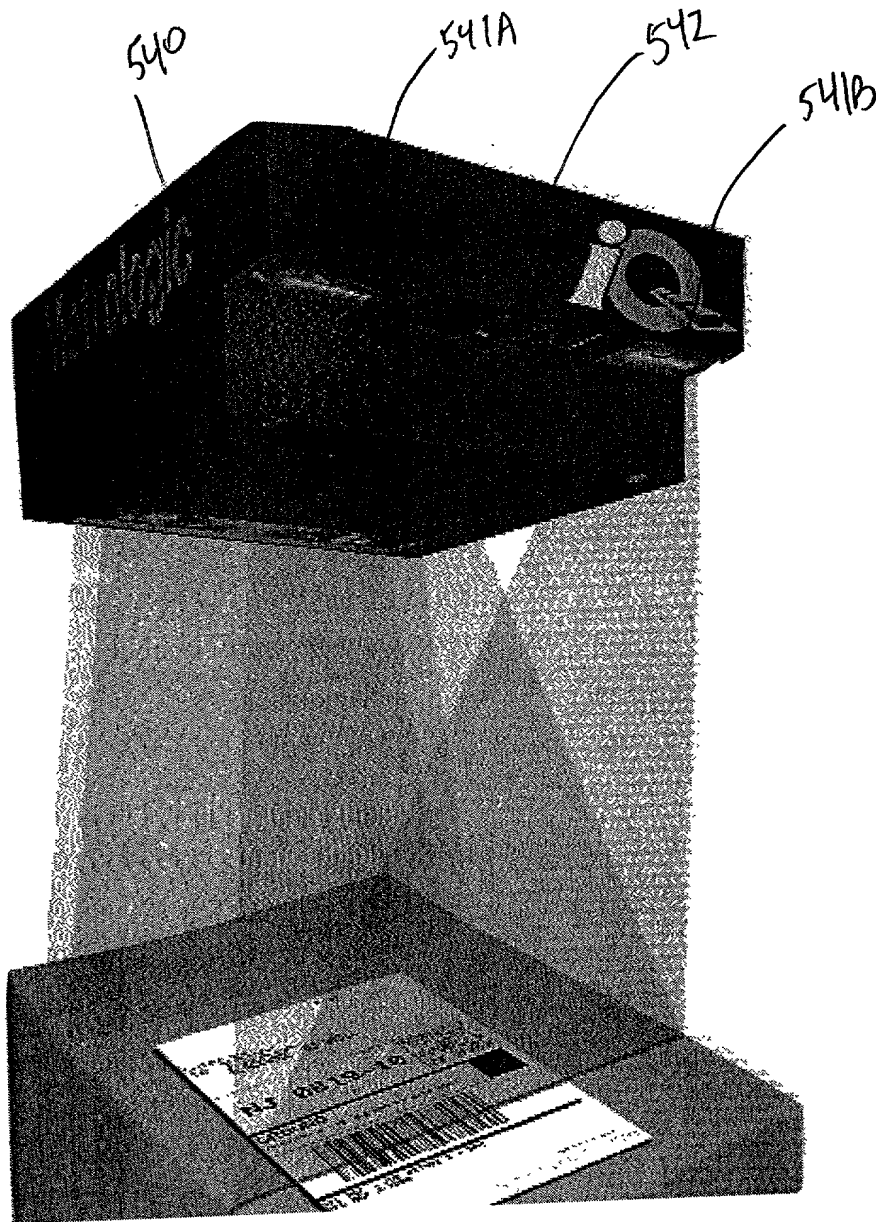


FIG. 13A

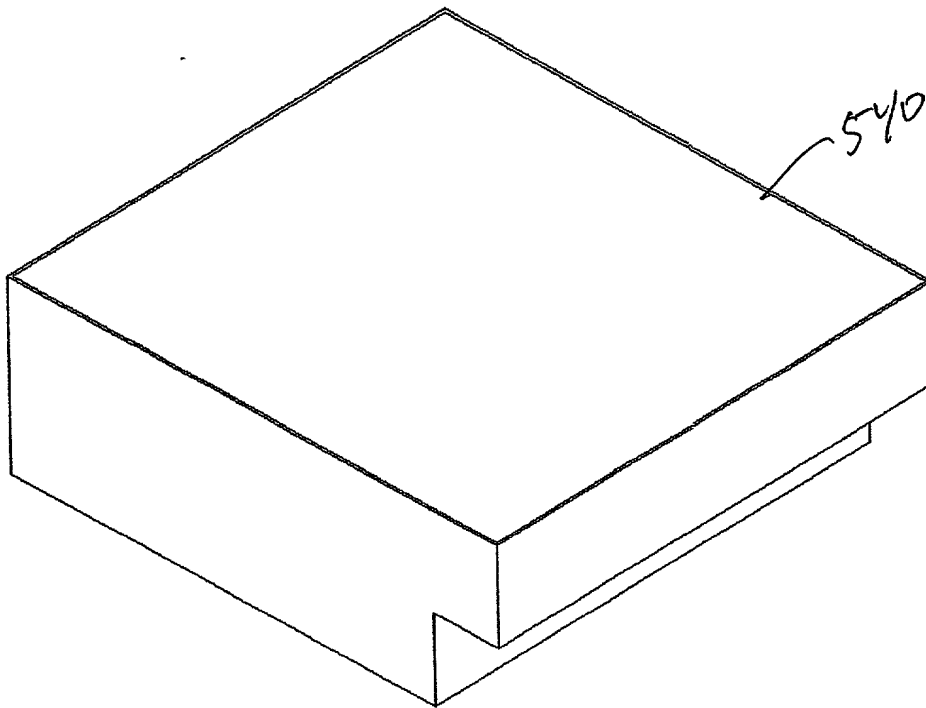


FIG. 13B

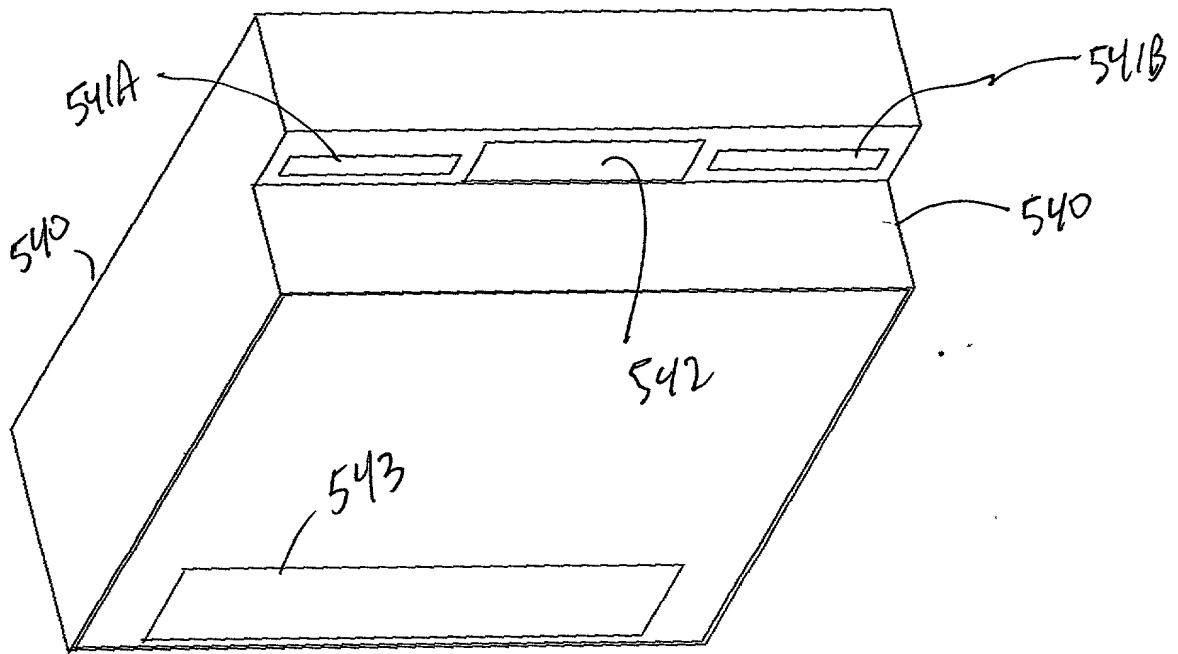


FIG. 13C

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PLLIM-BASED PACKAGE IDENTIFICATION AND DIMENSIONING (PID) SYSTEM

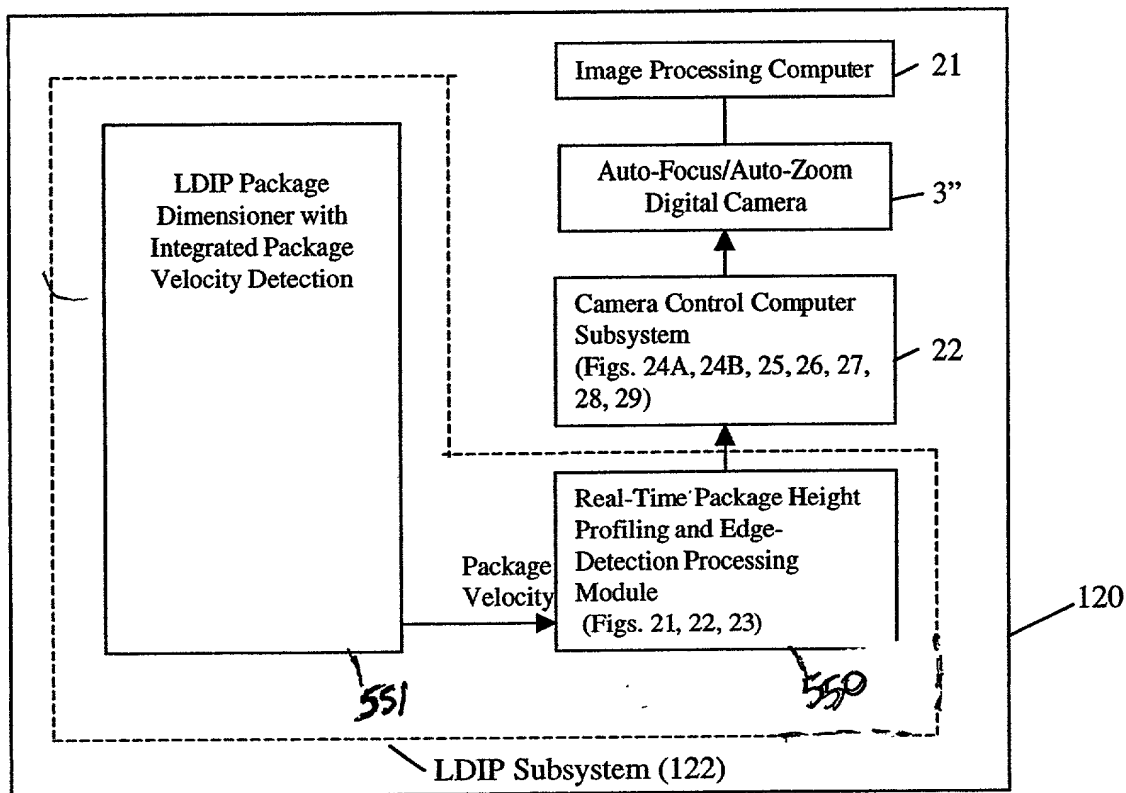


FIG. 14

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LDIP REAL-TIME PACKAGE HEIGHT PROFILE AND EDGE DETECTION METHOD

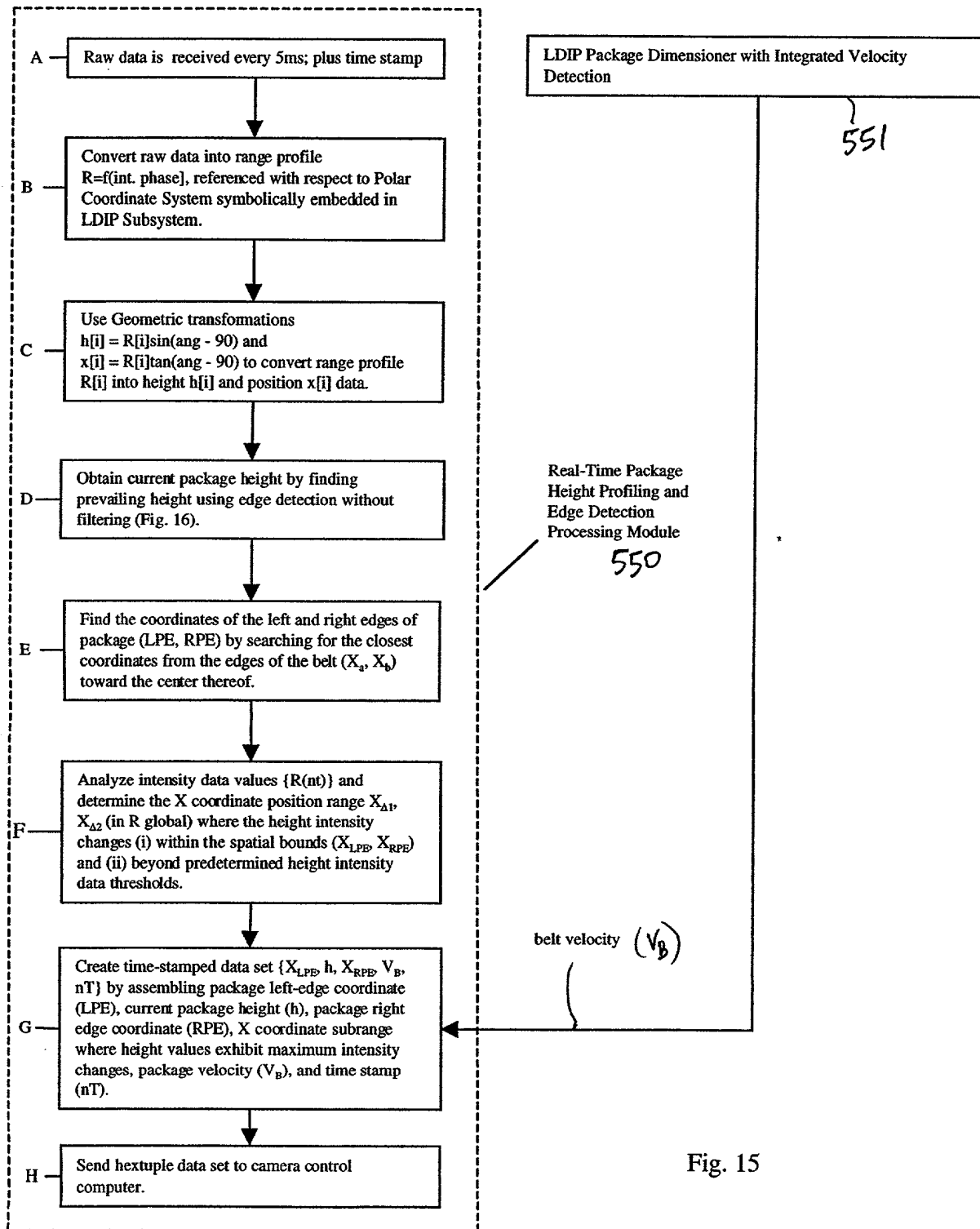


Fig. 15

LDIP Real Time Package Edge Detection

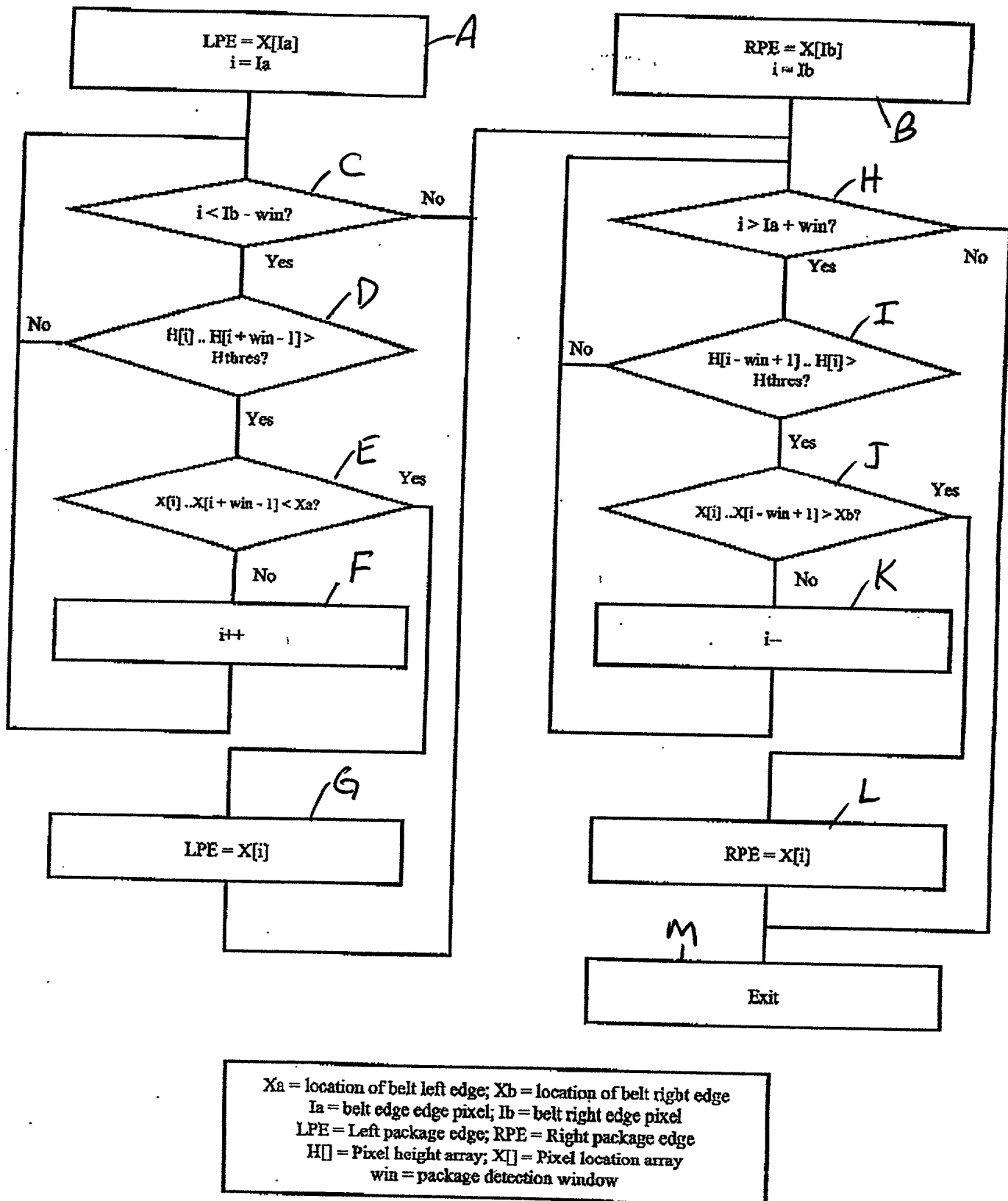


FIG. 16

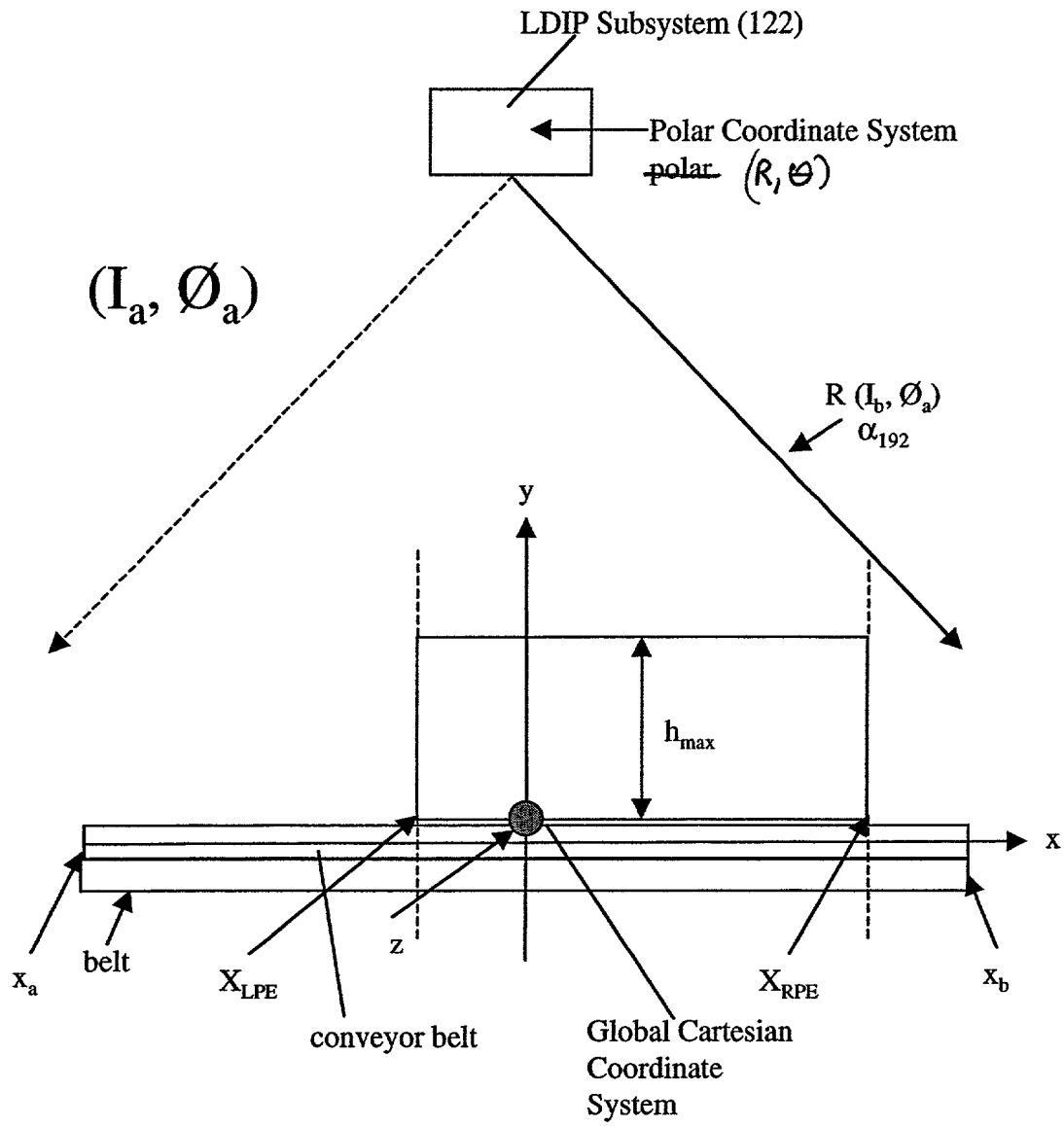


Fig. 17

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INFORMATION MEASURED AT SCAN ANGLES BEFORE COORDINATE TRANSFORMS

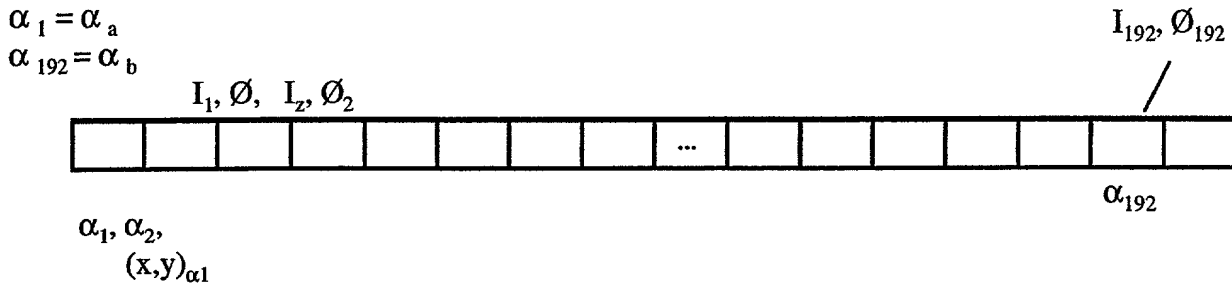


Fig. 17A

RANGE AND POLAR ANGLE MEASURES TAKEN AT SCAN ANGLE α BEFORE COORDINATE TRANSFORMS



Fig. 17B

MEASURED PACKAGE HEIGHT AND POSITION VALUES AFTER COORDINATE TRANSFORMS

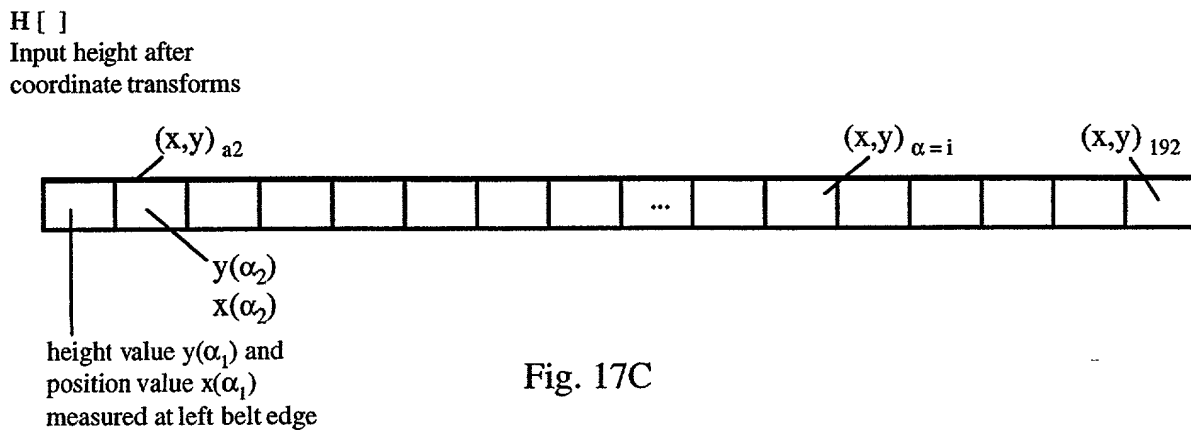


Fig. 17C

CAMERA CONTROL PROCESS CARRIED OUT WITHIN THE CAMERA CONTROL SUBSYSTEM OF EACH OBJECT ATTRIBUTE ACQUISITION AND ANALYSIS SYSTEM

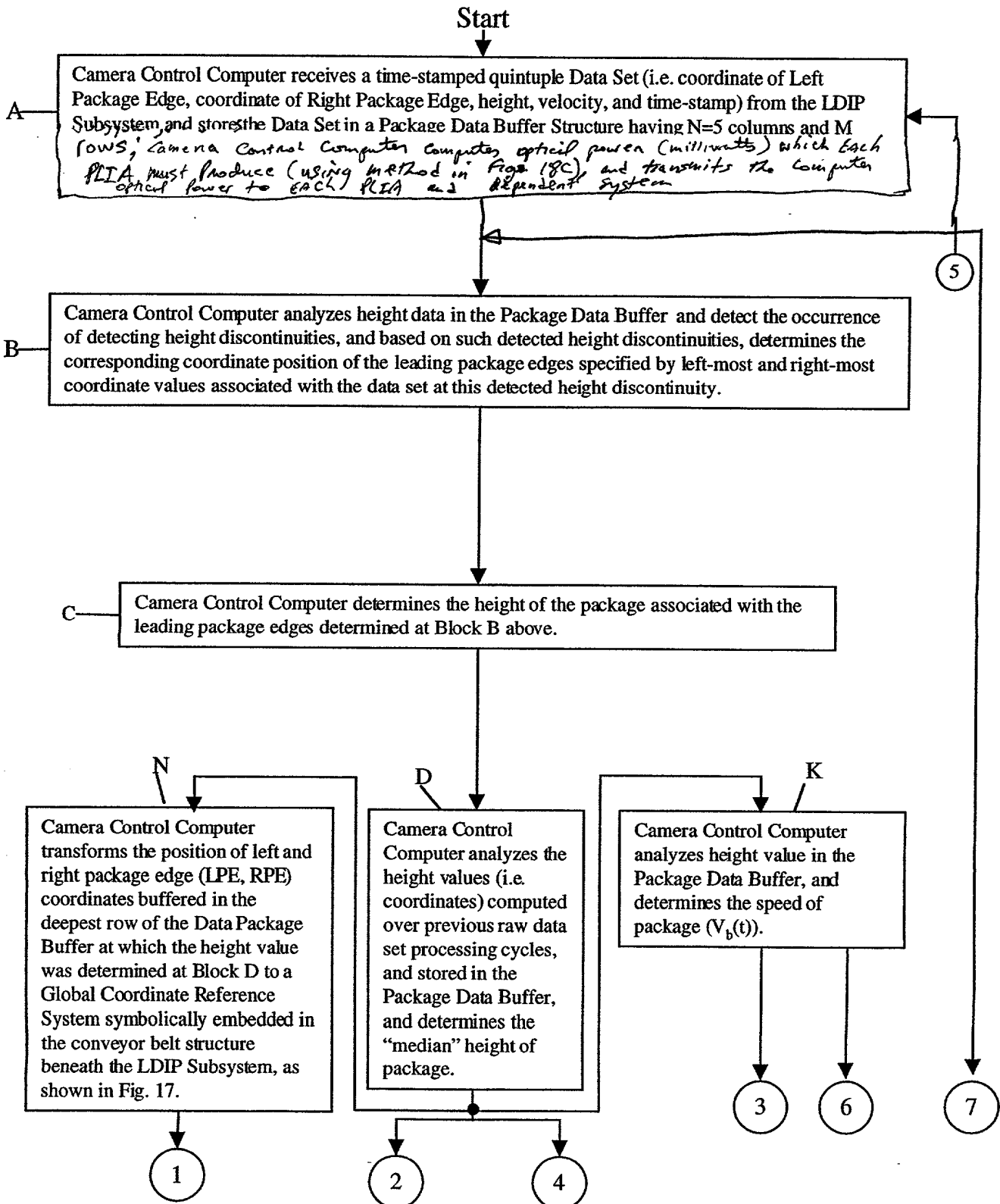


Fig. 18A

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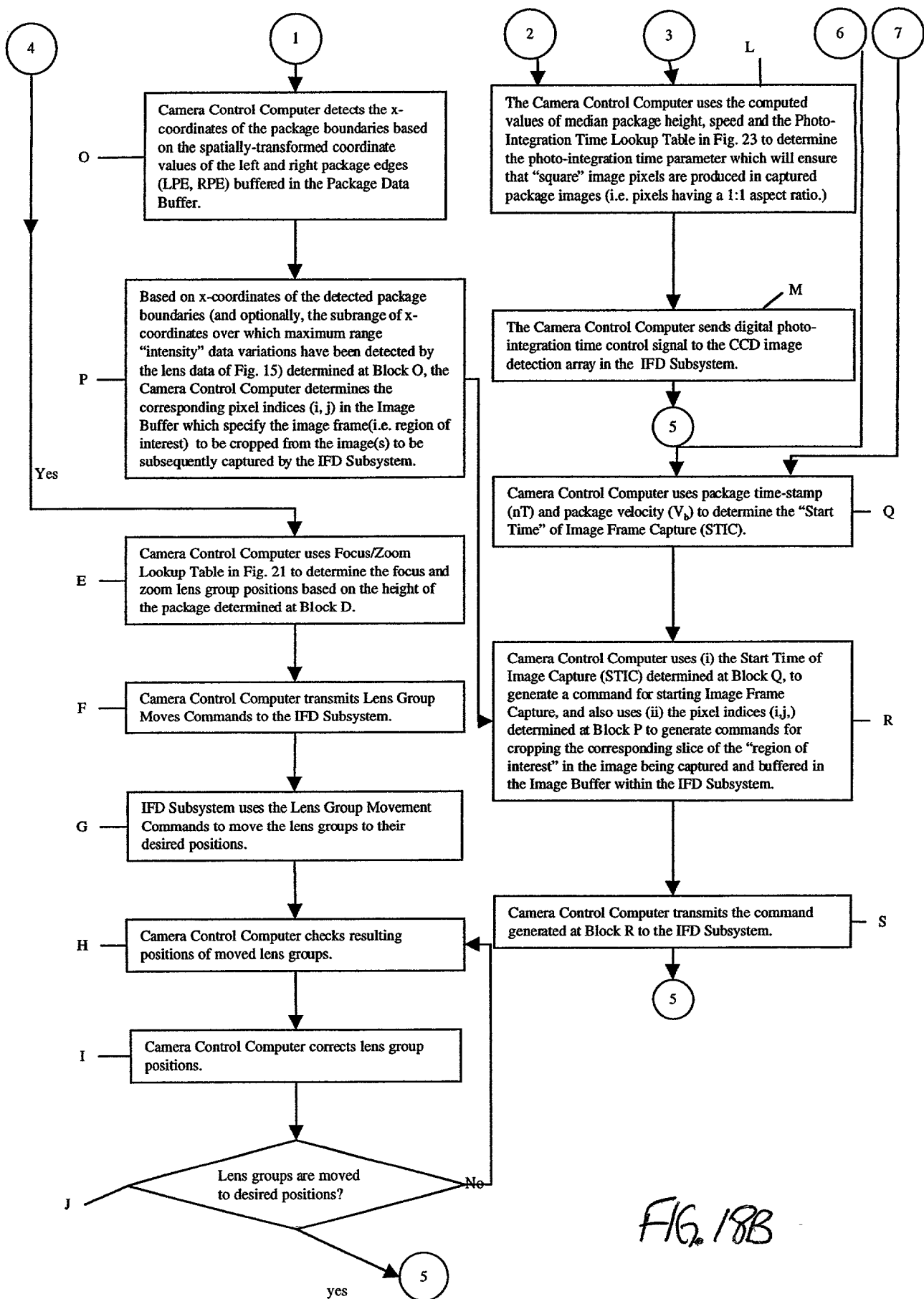


FIG. 18B

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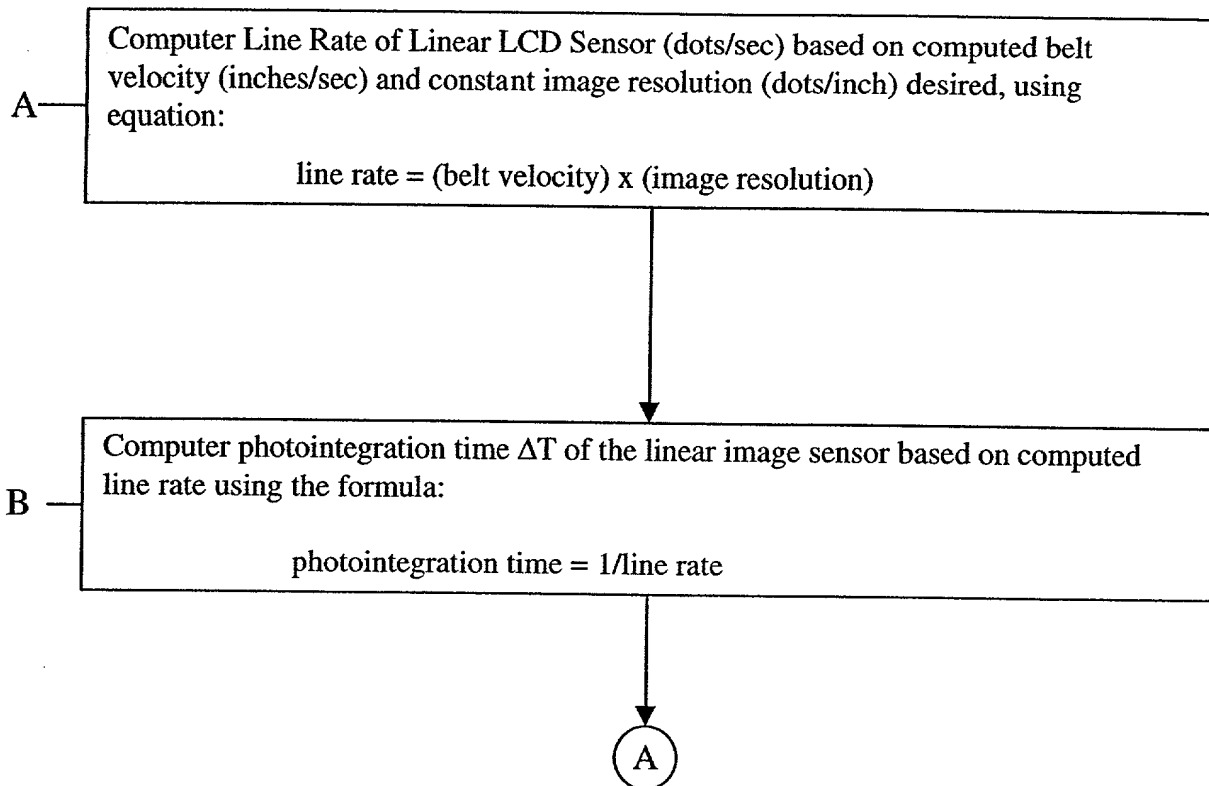


Fig. 18C1

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Compute optical power (milliwatts) of each PLIA based on computed photointegration time (ΔT) using the following formula:

$$\text{optical power of LD (milliwatts)} = \frac{\text{constant}}{\text{photointegration time } \Delta T}$$

Fig. 18C2

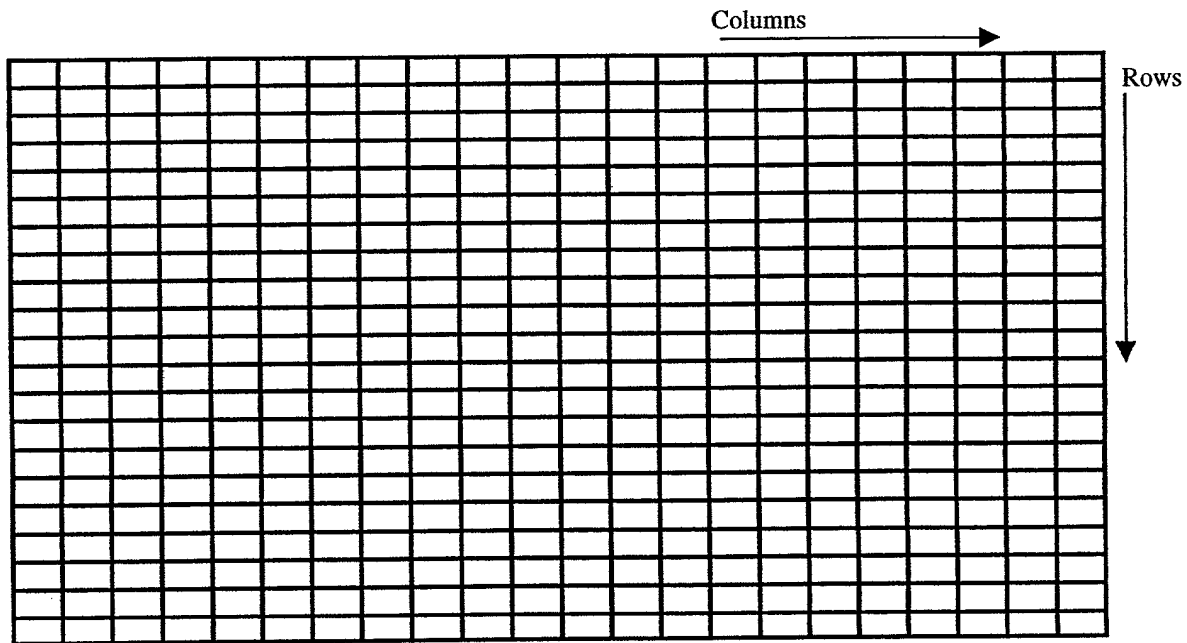
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X coordinate subrange where
maximum range "intensity"
variations have been detected

Left Package Edge (LDE)	Package Height (h)	Right Package Edge (RPE)	Package Velocity	Time-stamp (nT)	
					Row 1
					Row 2
					Row 3
					Row 4
					Row 5
					Row M

Package Data Buffer (FIFO)

Fig. 19



Camera Pixel Data Buffer
pixel indices (i,j)

Fig. 20

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Zoom and Focus Lens Group Position

Look-up Table

Distance from Camera H (mm)	Zoom group distance (mm) Y (Zoom)	Focus group distance (mm) Y (Focus)
1000	21.57489228	2.47E-05
1100	19.38089696	10.99009783
1200	17.10673434	20.65783177
1300	14.77137314	29.10917002
1400	12.39153565	36.47312595
1500	9.979114358	42.87845436
1600	7.540639114	48.44003358
1700	5.078794775	53.25495831
1800	2.595989366	57.40834303
1900	0.099972739	60.98883615

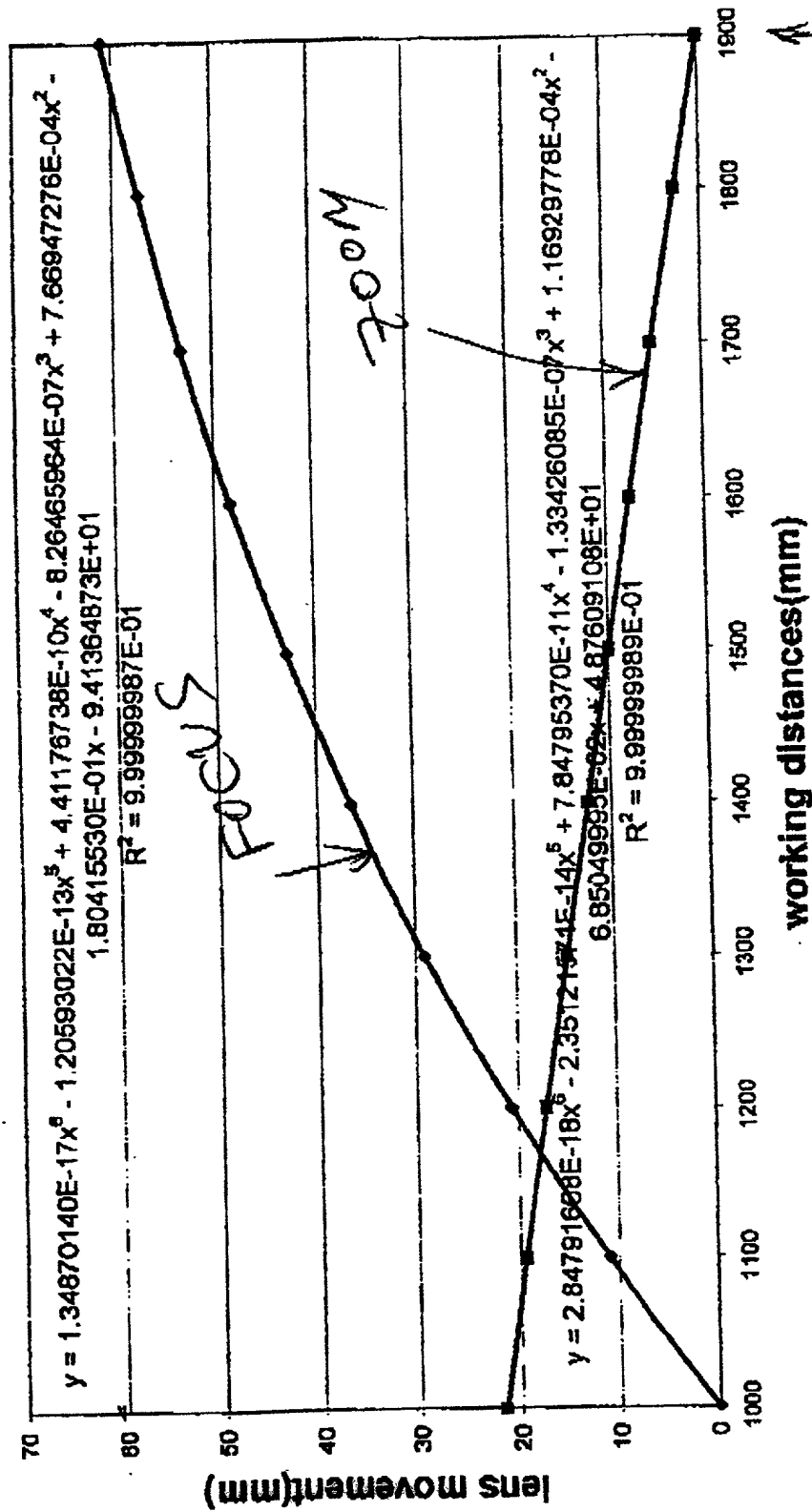
(use interpolation techniques for working distances between listed points in table)

FIG. 21

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* Note: The feed distance & zoom (eff. focal length) of camera lens are coupled (interdependent) in this camera has a fixed aperture F5.6

Focus and Zoom lens movement vs. working distances



↑ (inches) 36 above conveyor belt

← package height above conveyor

conveyor-belt surface

FIG. 22

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600 feet per minute
(FPM)

Photo-Integration Time Look-up Table

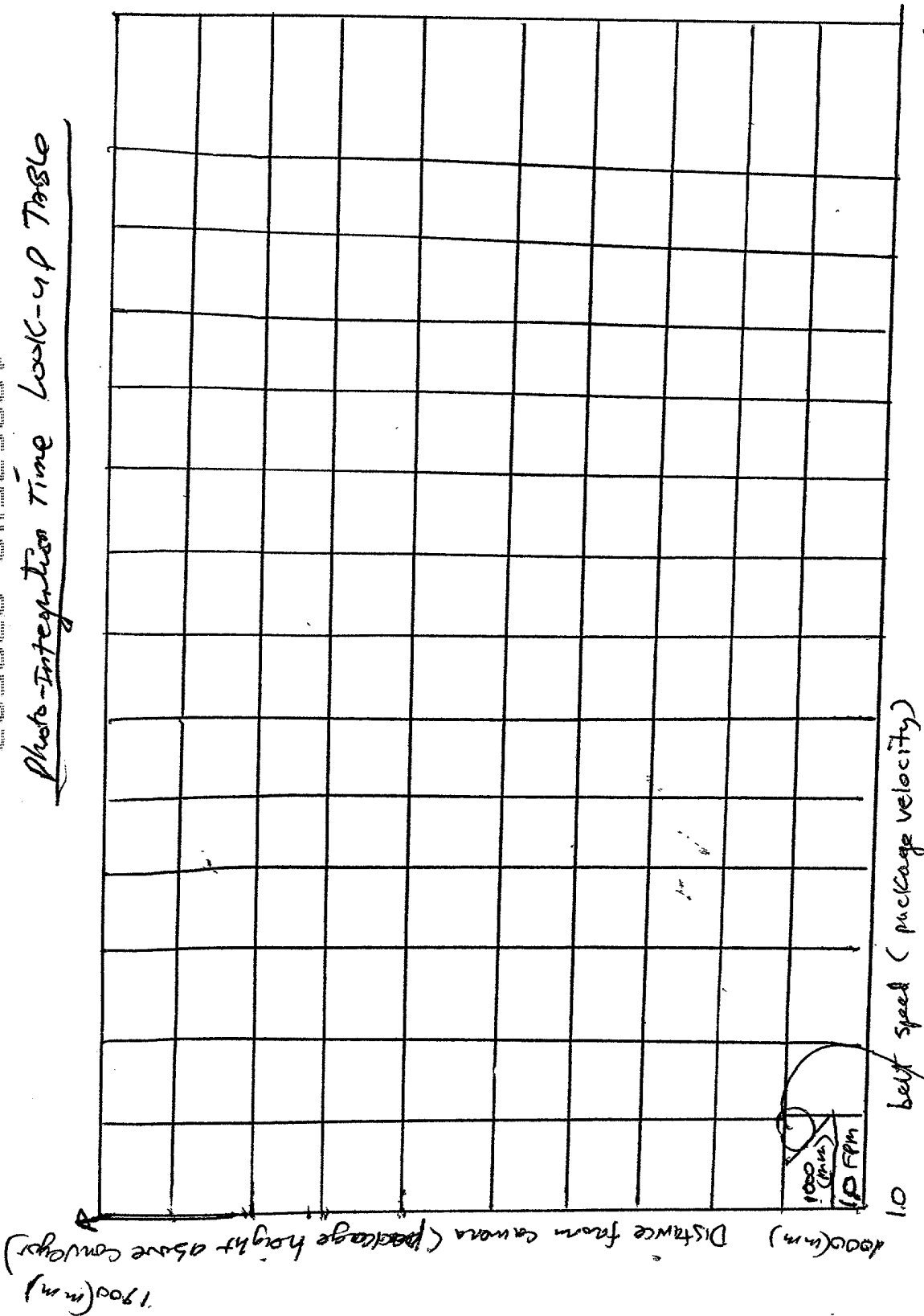


FIG. 23

Photo-Integration
Time value that
Ensures square image pixels
(1:1 aspect ratio)

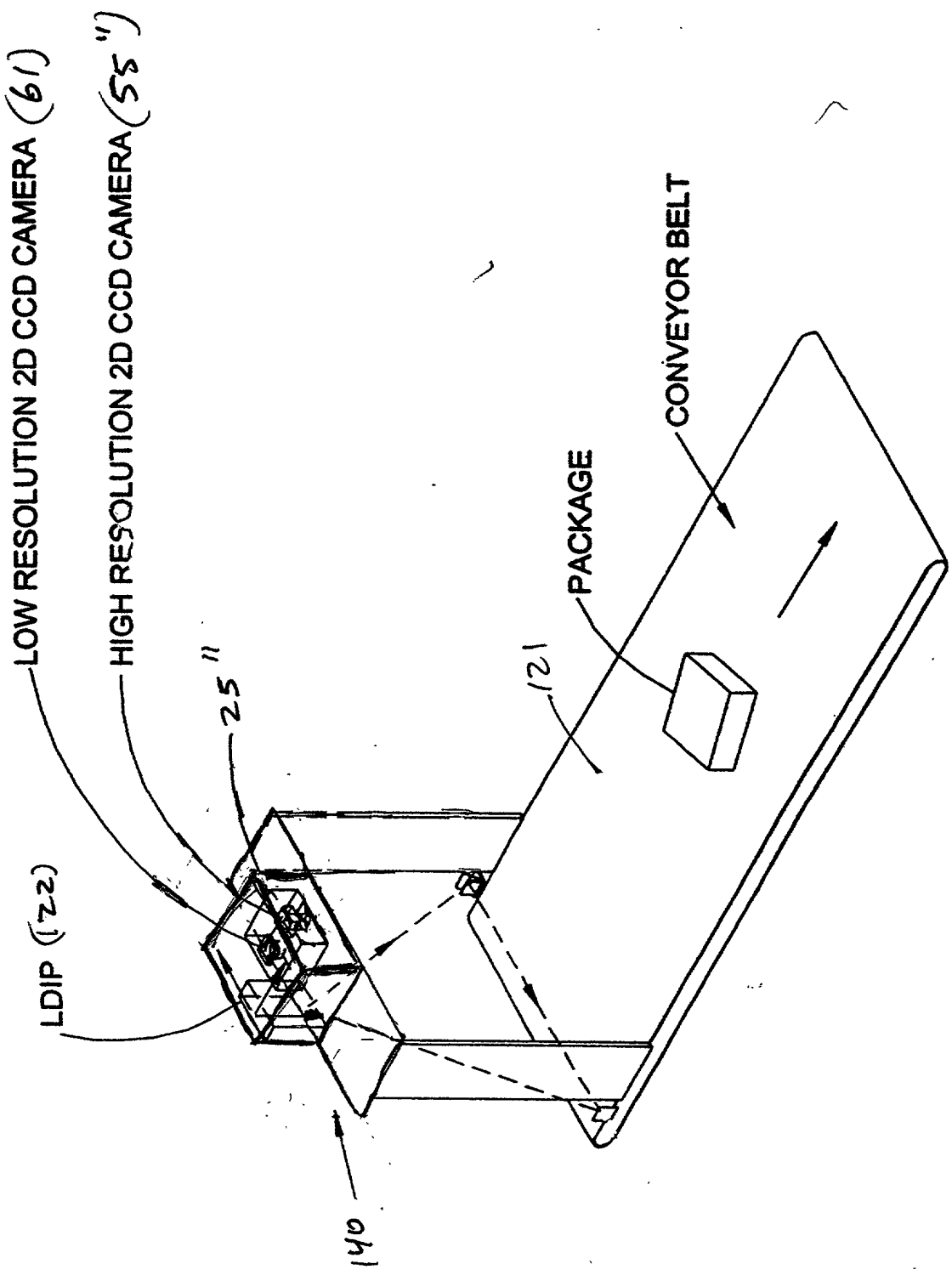


FIG 24

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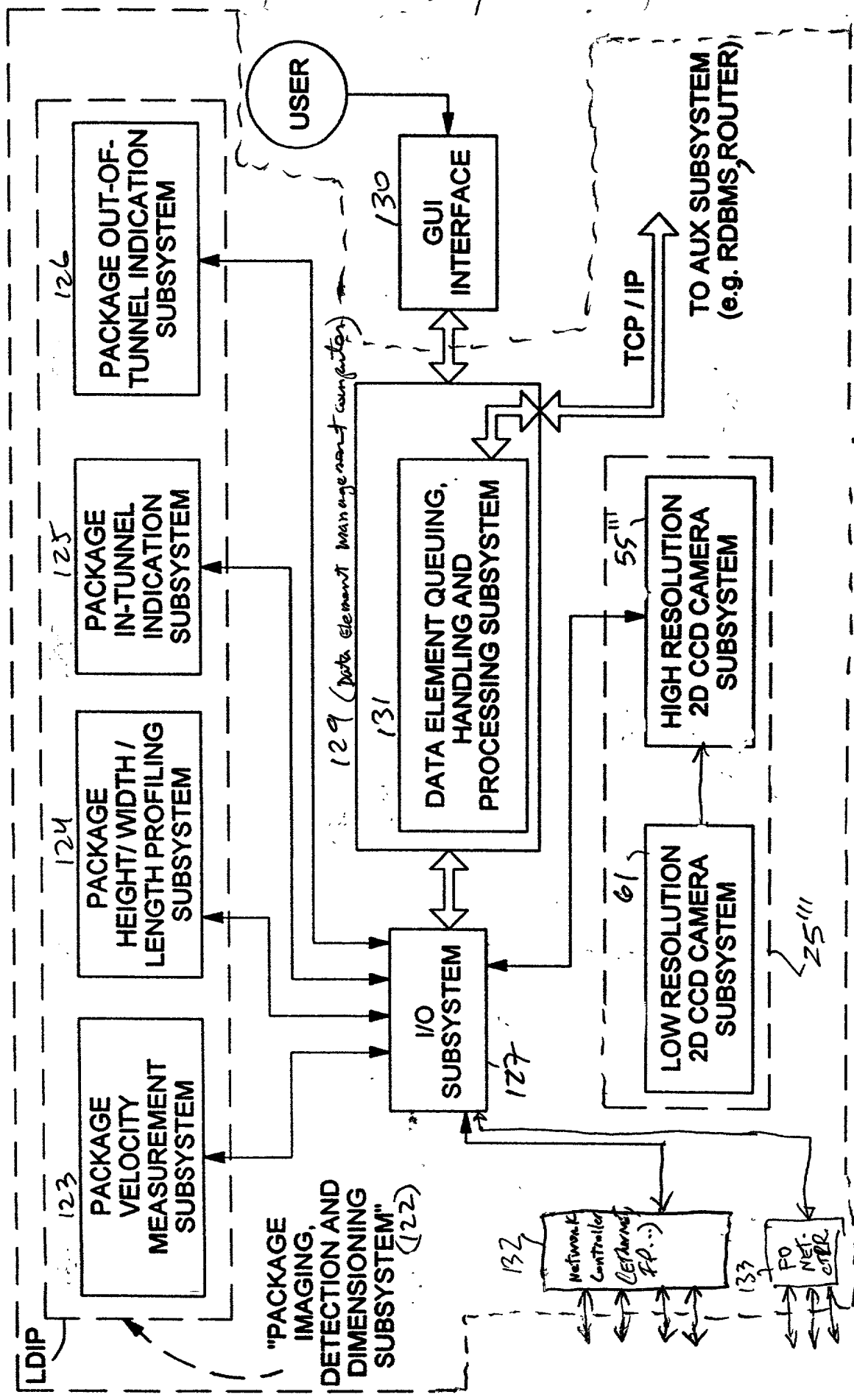


FIG. 25

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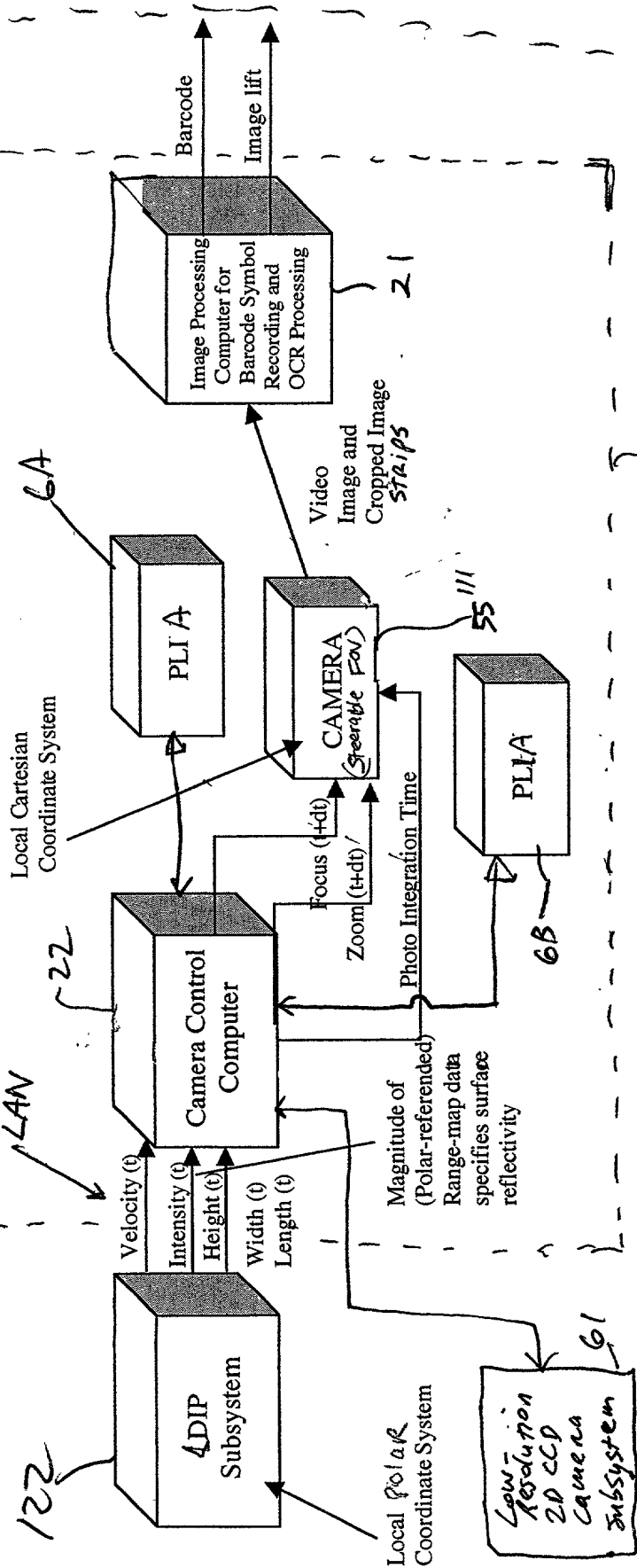


FIG. 26

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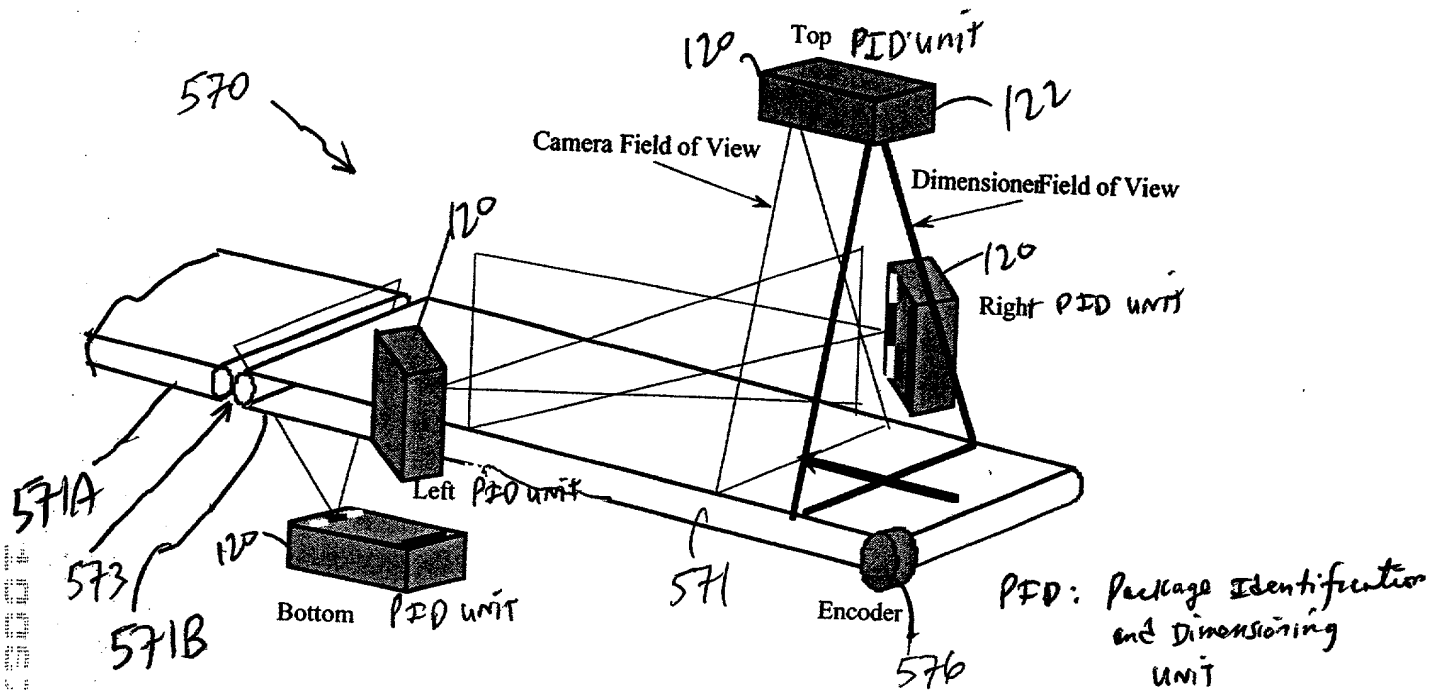


FIG 27

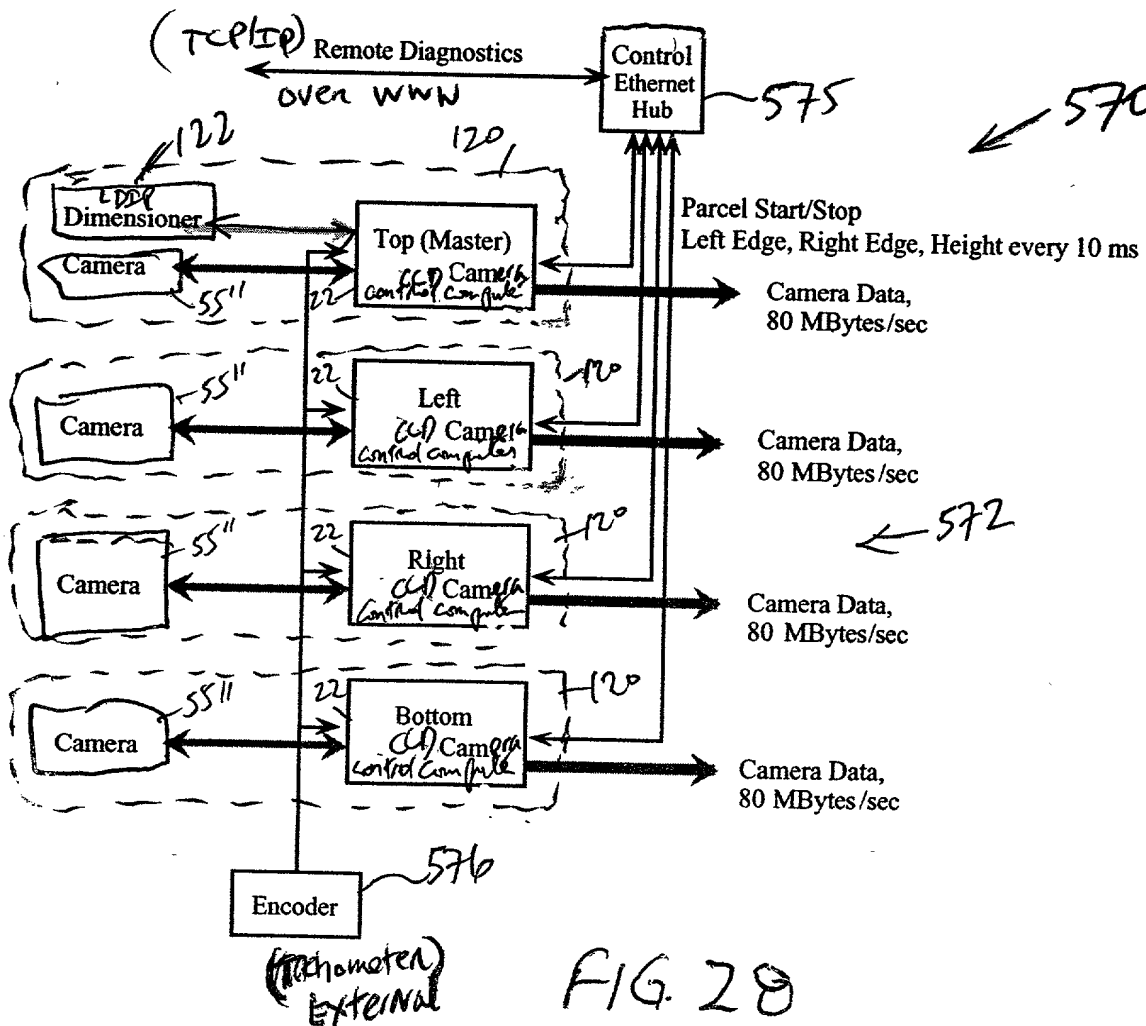


FIG 28

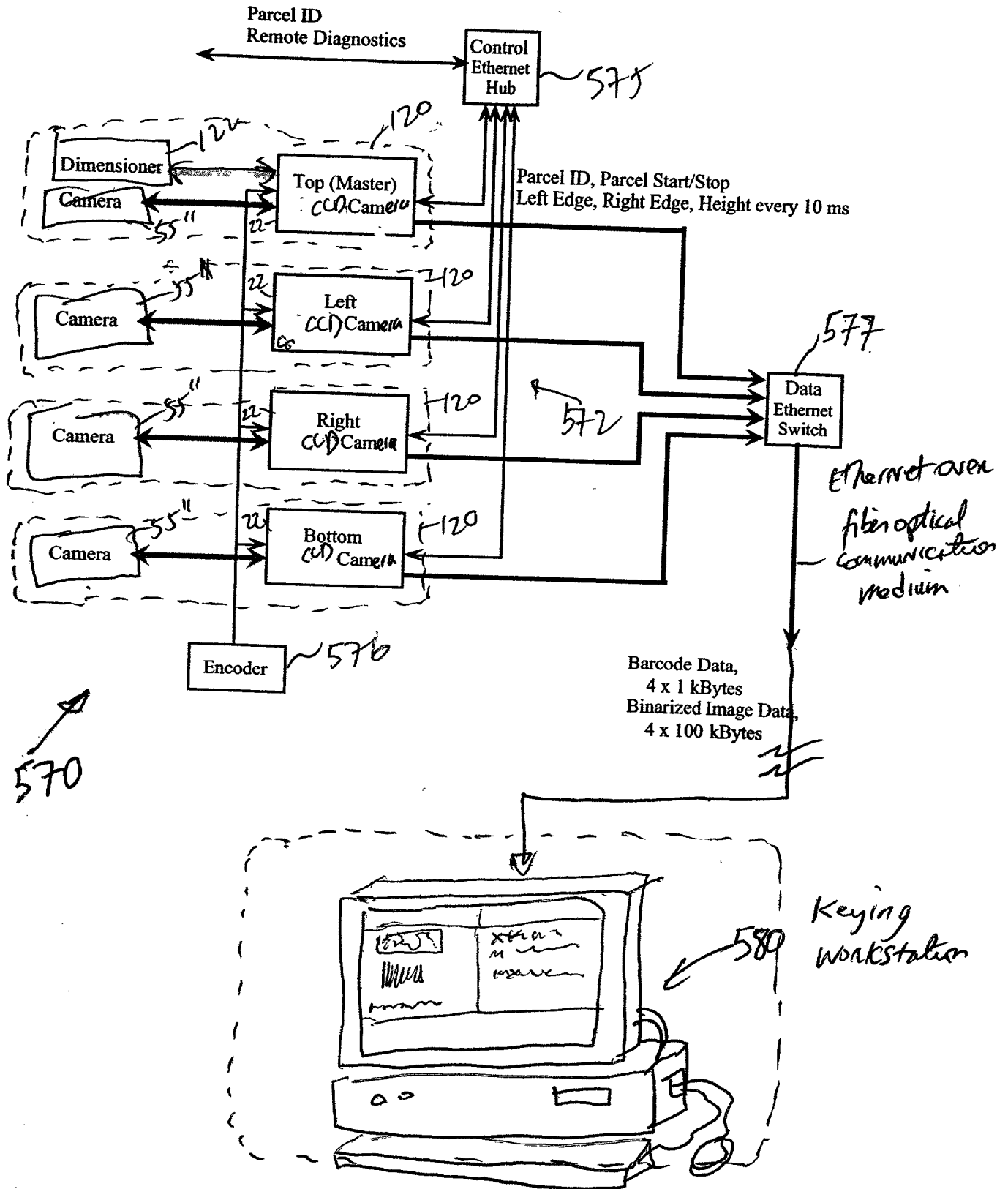


FIG. 29

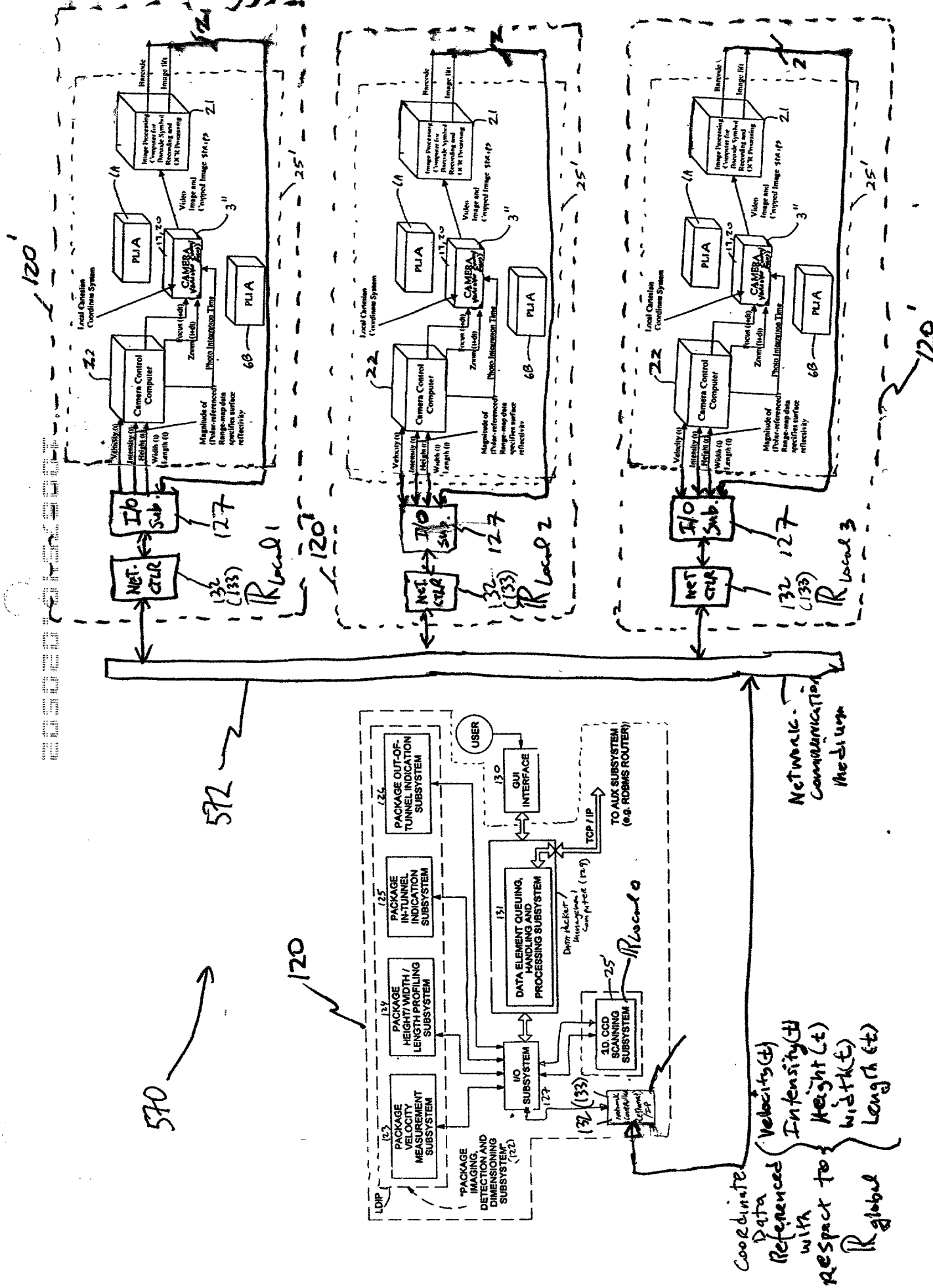


FIG 30

CCD Camera-Based Tunnel System
Employing Package Coordinate Data
Driven Method of Automatic Camera
Zoom and Focus Control

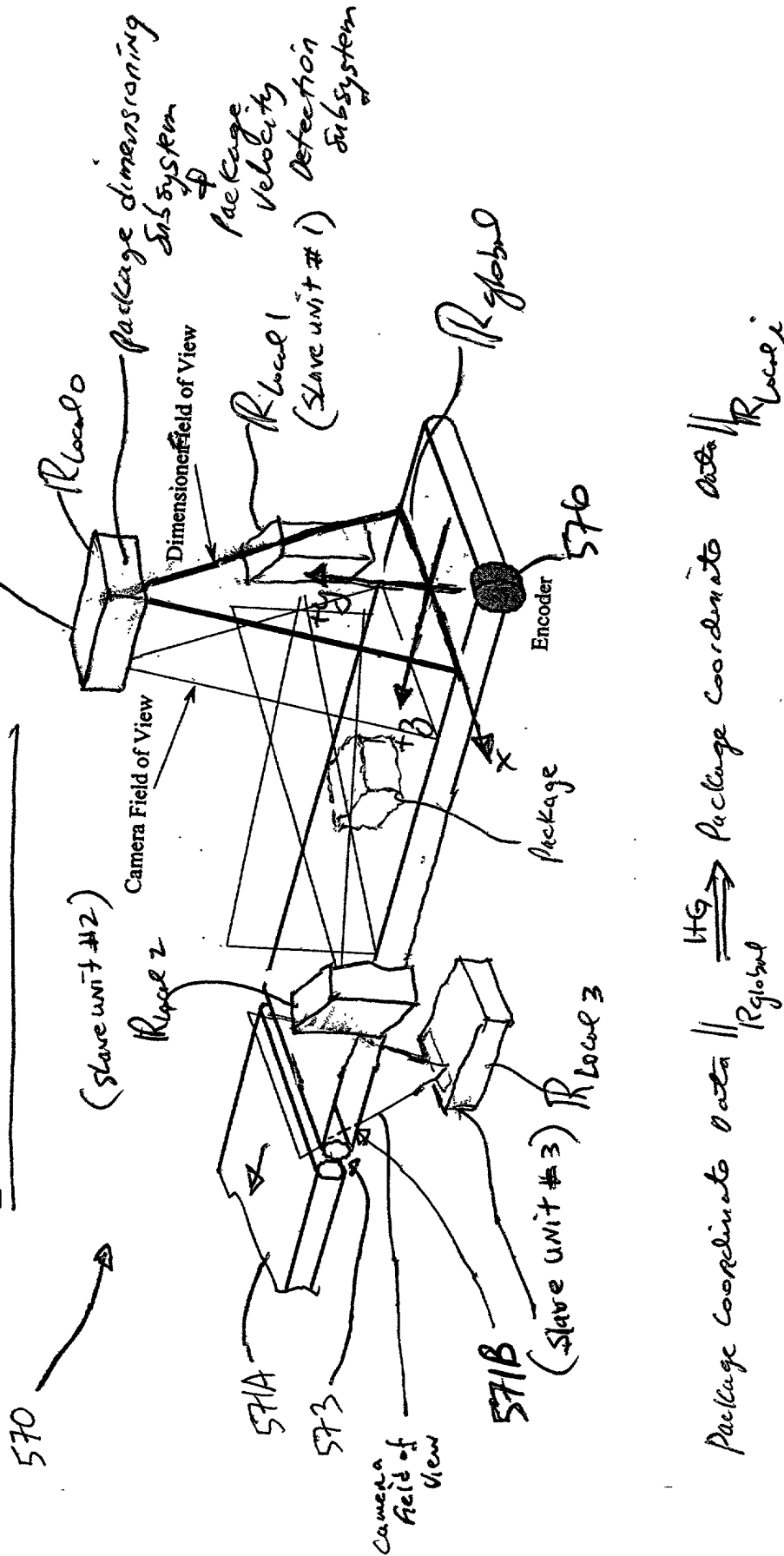


FIG. 31

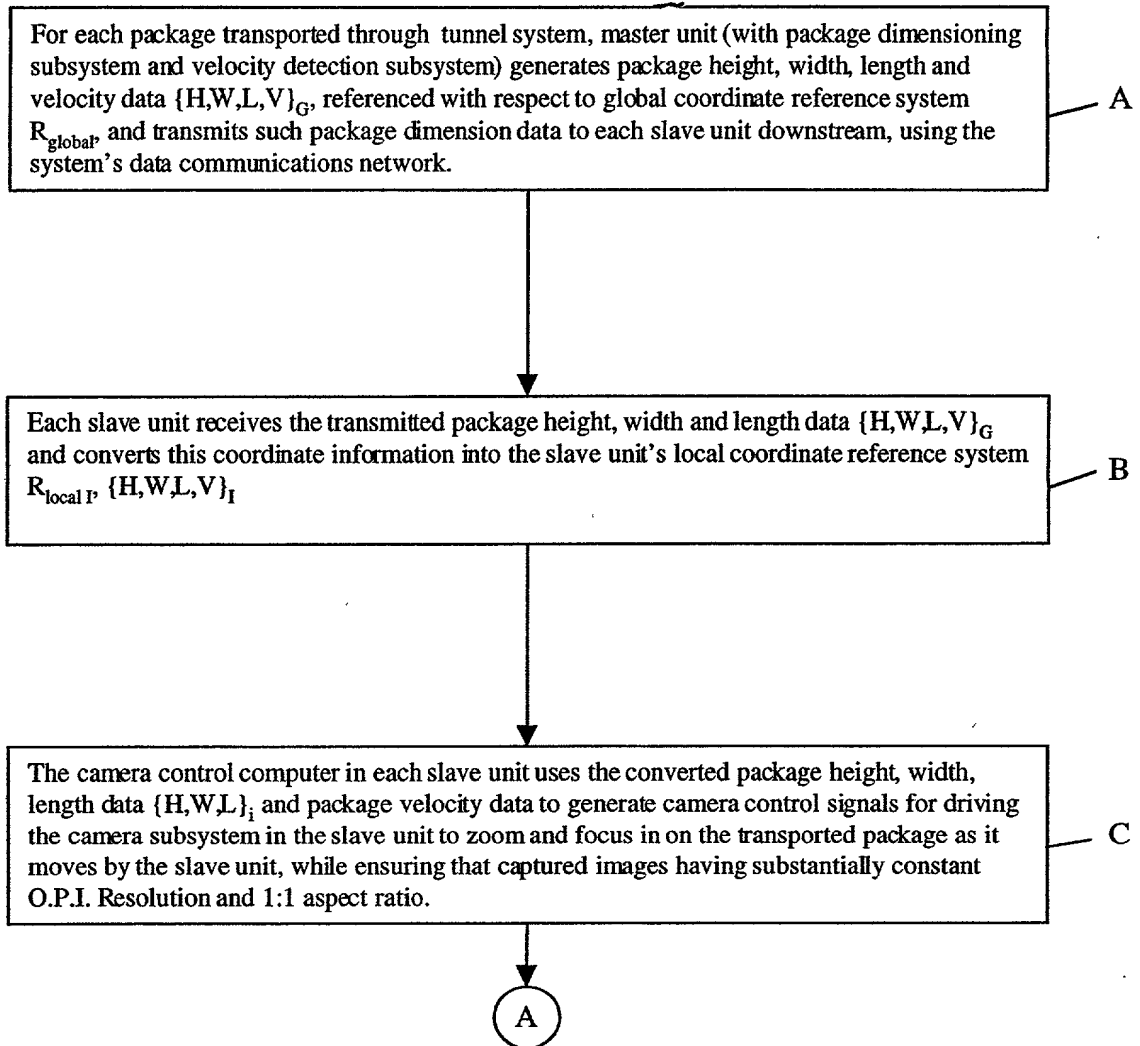


FIG. 32A



Each slave unit captures images acquired by its intelligently controlled camera subsystem, buffers the same, and processes the images to decode bar code symbol identifiers represented in said images, and/or to perform optical character recognition (OCR) thereupon.

D

The slave unit which decodes a bar code symbol in a processed image automatically transmits a package identification data element (containing symbol character data representative of the decoded bar code symbol) to the master unit (or other designated system control unit employing data element management functionalities) for package data element processing.

E

Master unit time-stamps received package identification data element, places said data element in a data queue, and processes package identification data elements and time-stamped package dimension data elements in said queue to link each package identification data element with one said corresponding package dimension data element.

F

FIG. 32B

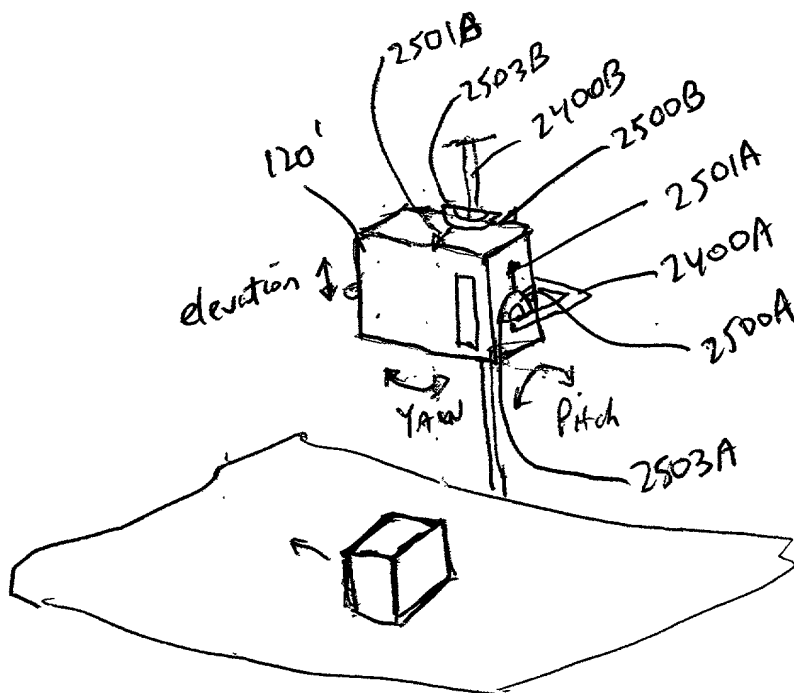


FIG. 31A

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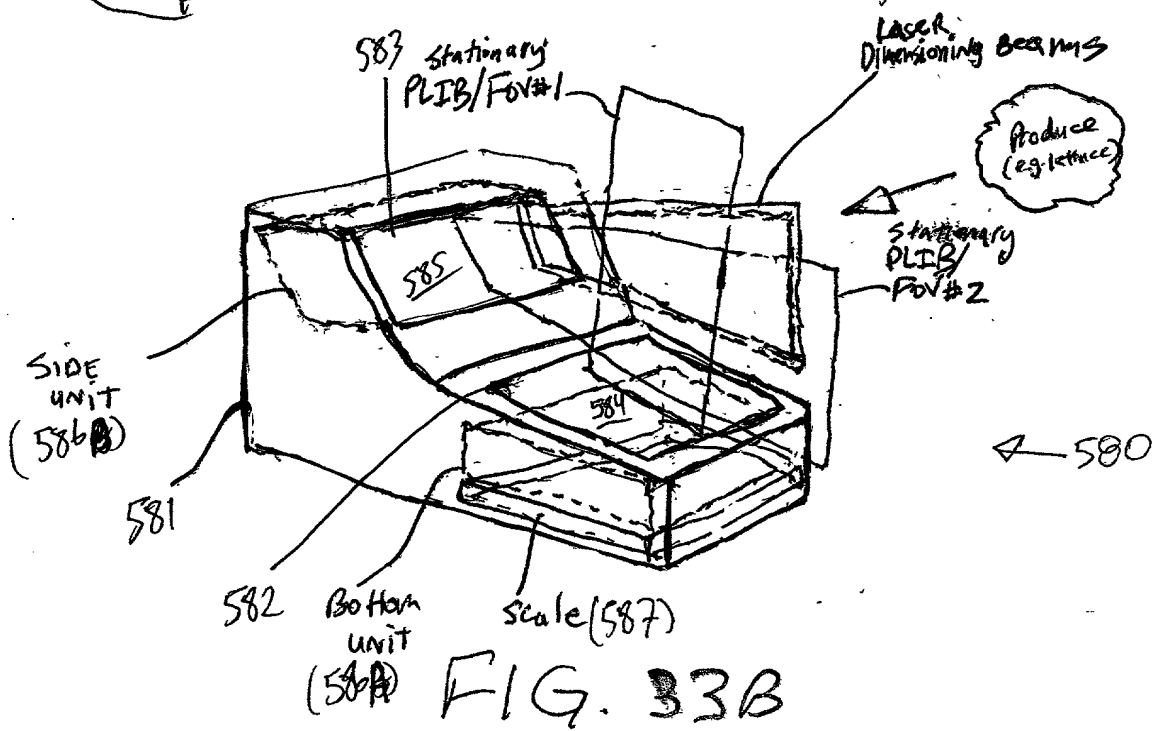
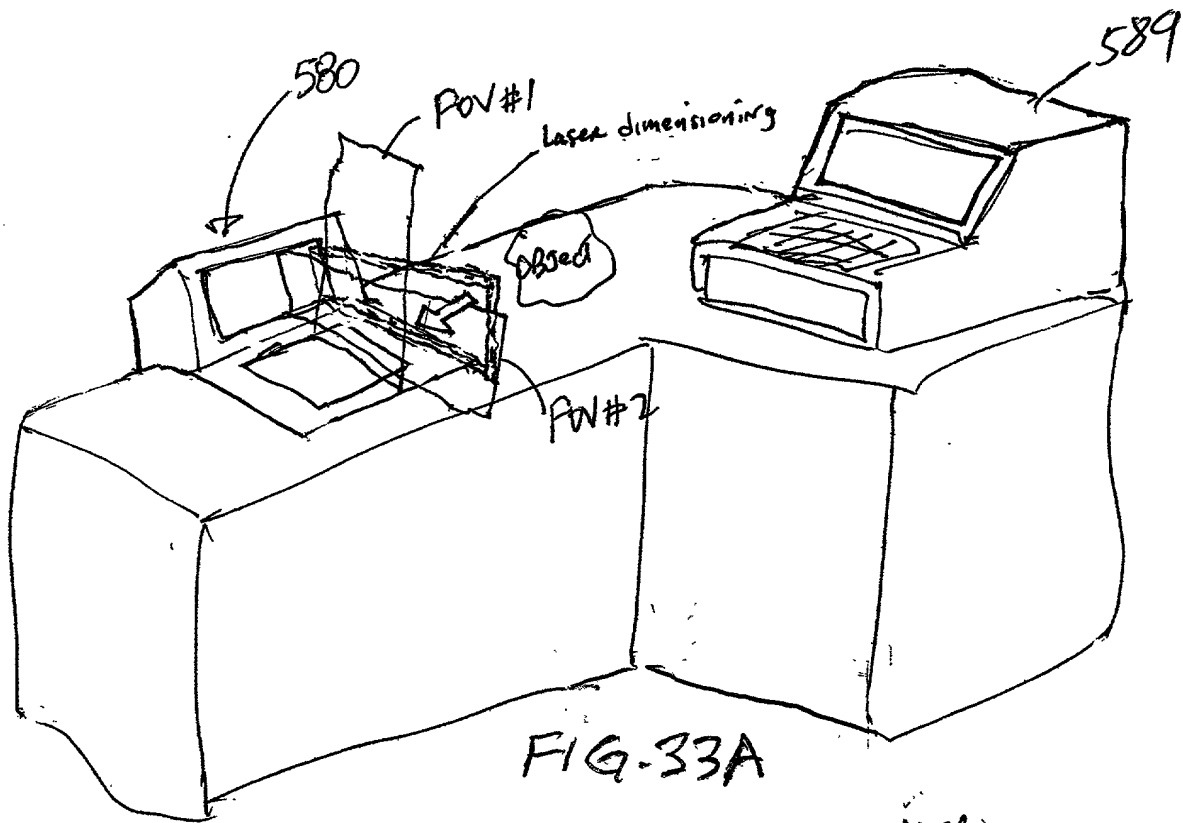




FIG. 33C

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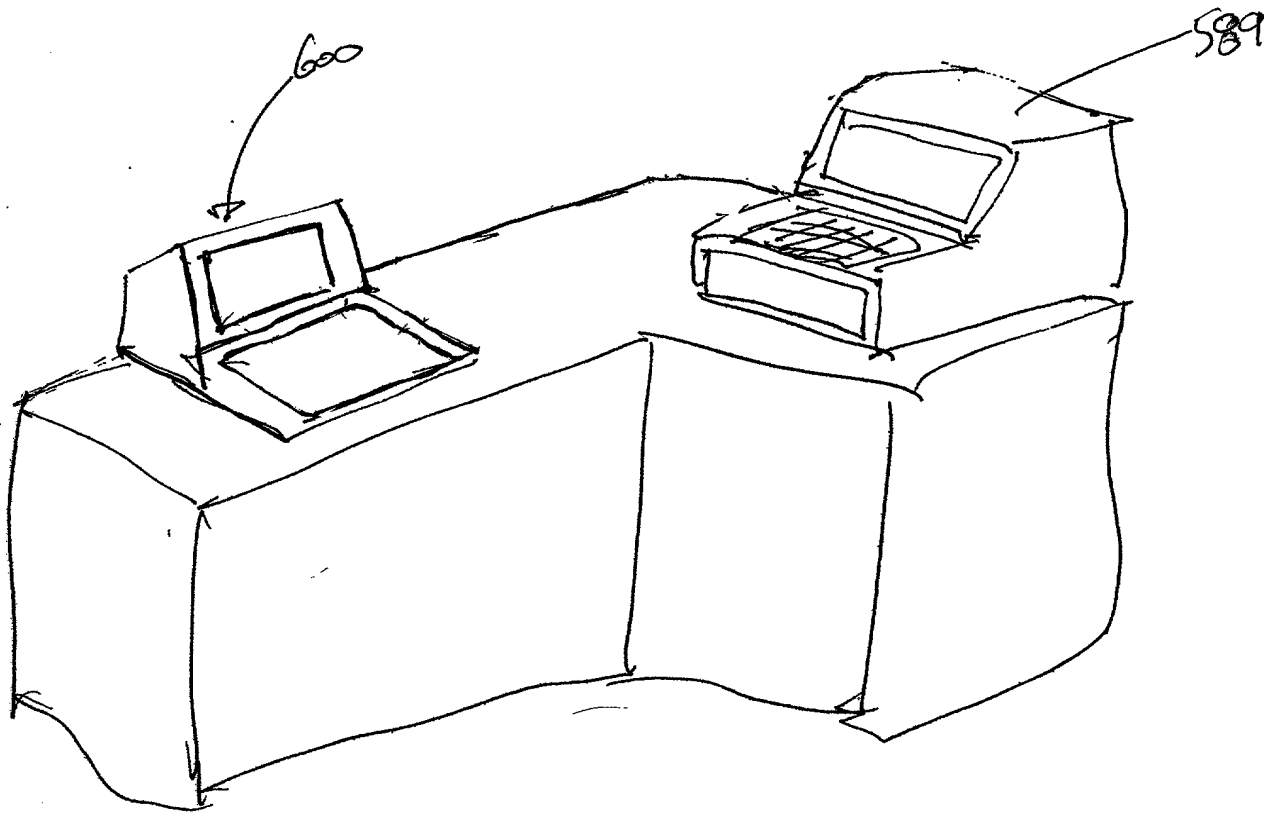


FIG. 34A

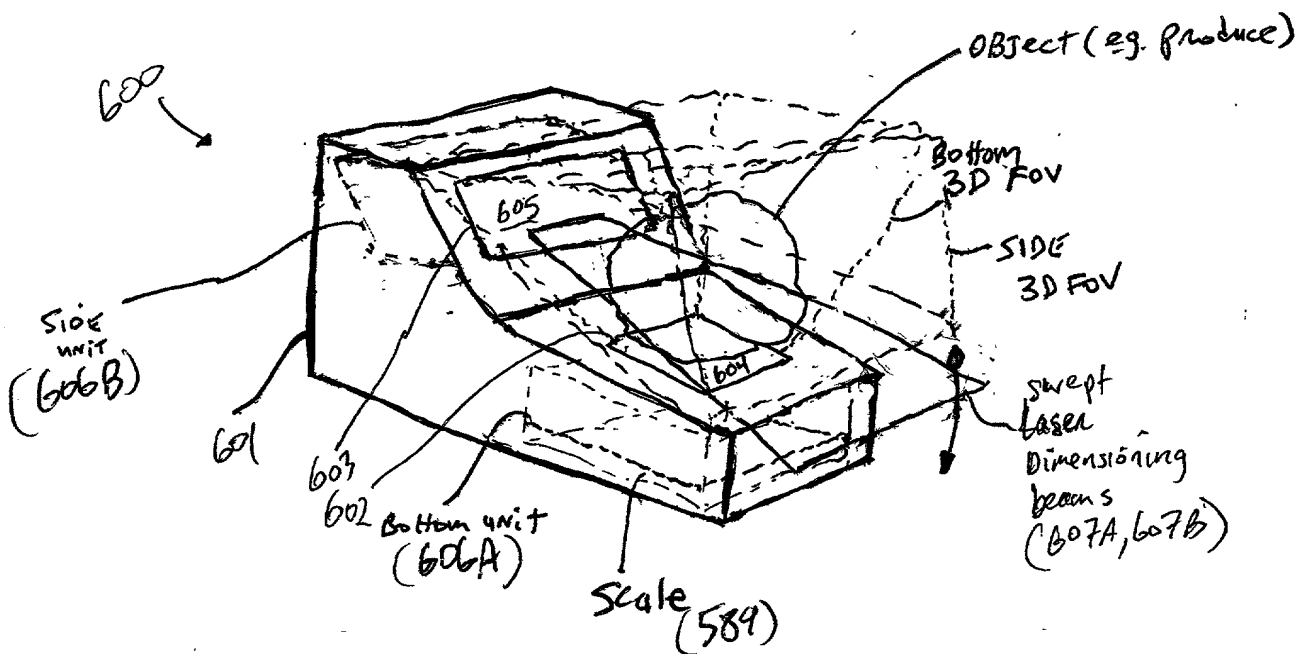
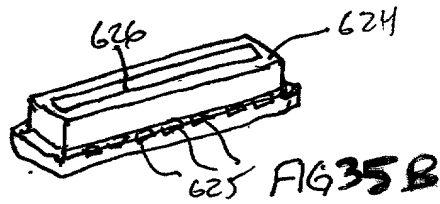
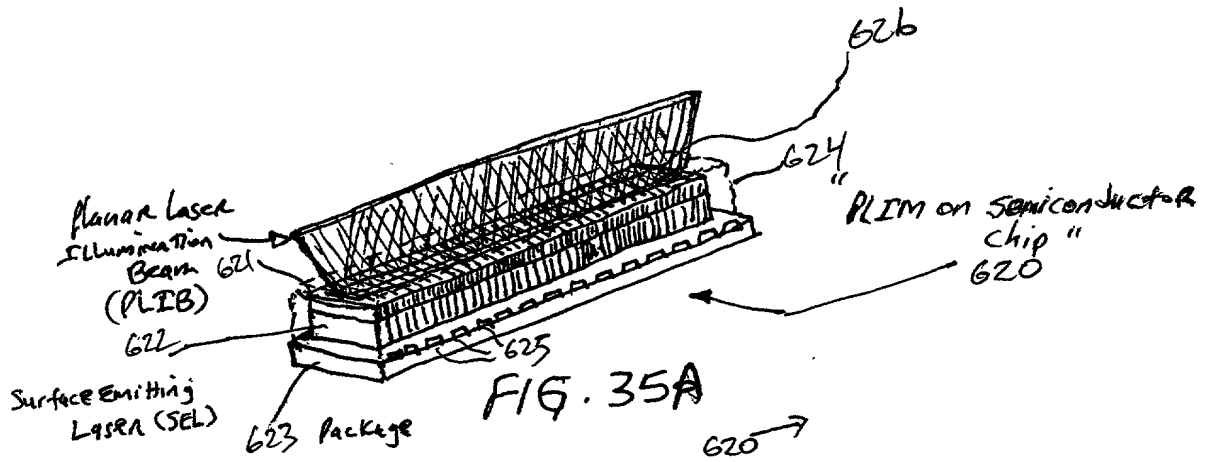


FIG. 34B



FIG. 34C



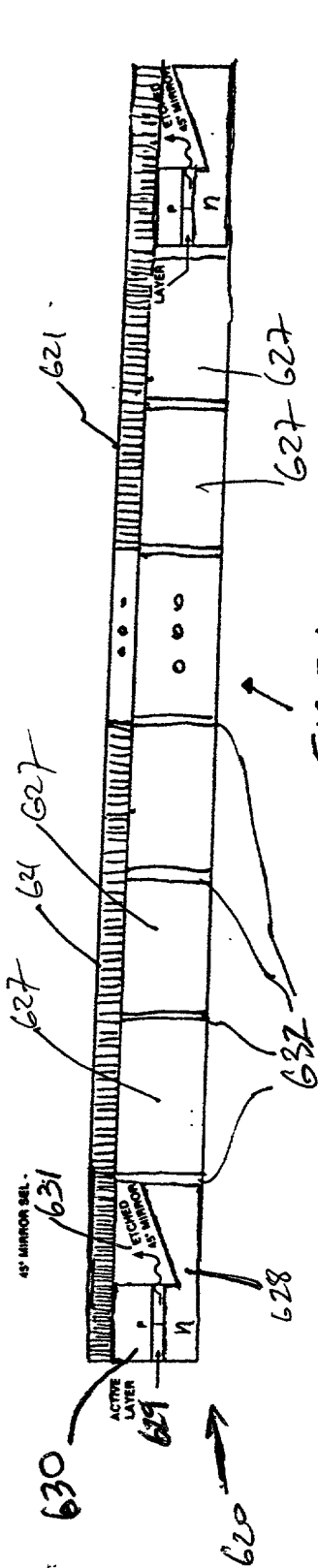


FIG. 36A

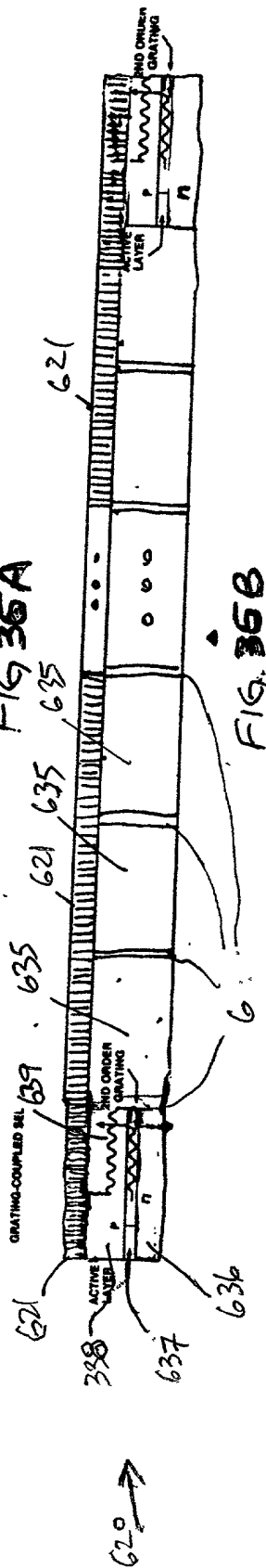


FIG. 36B

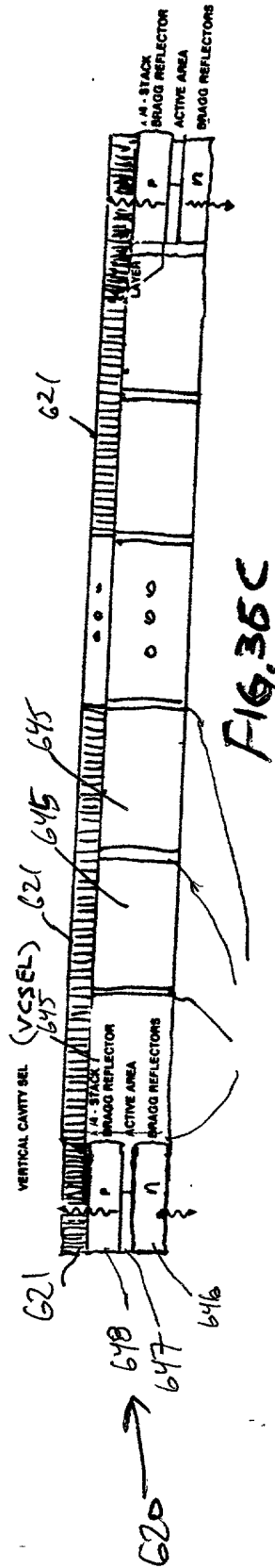


FIG. 36C

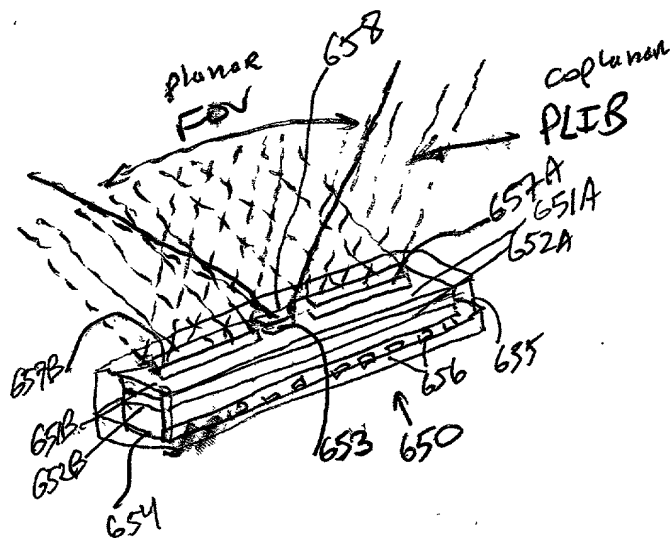


FIG. 37

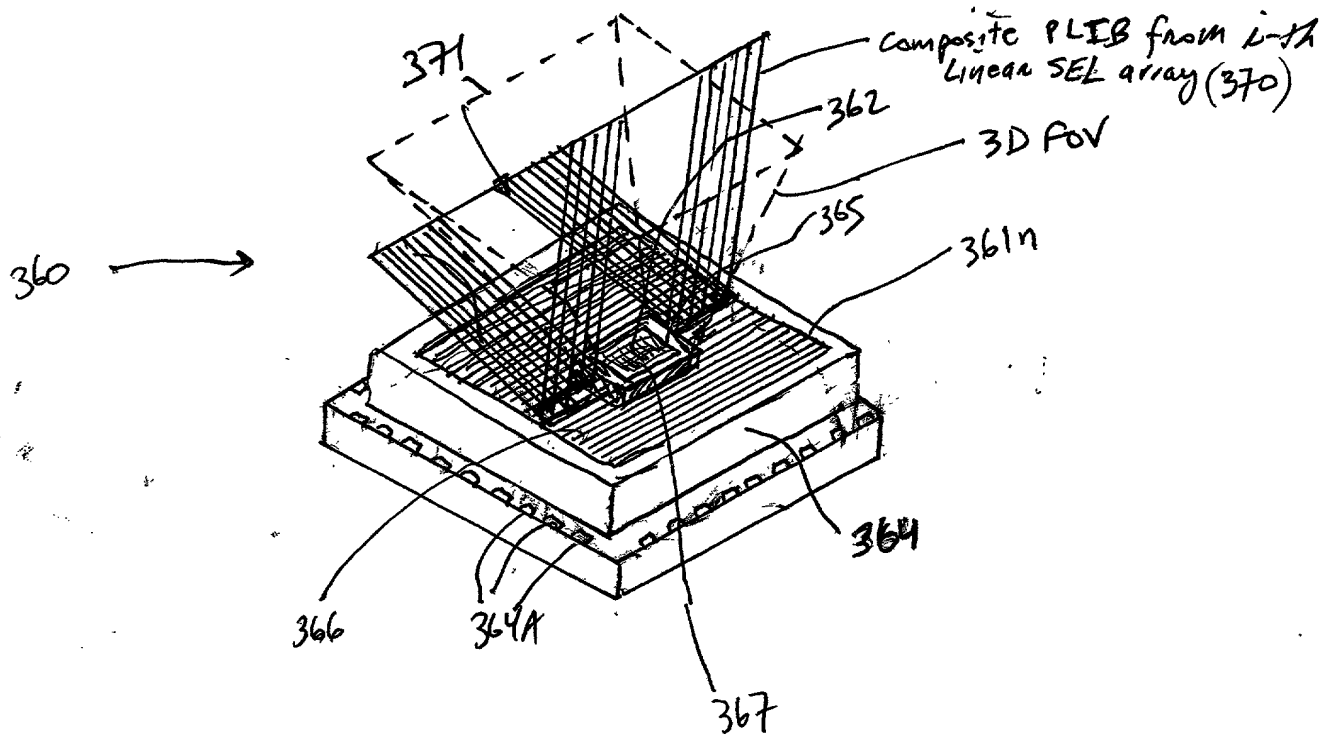


FIG. 38A

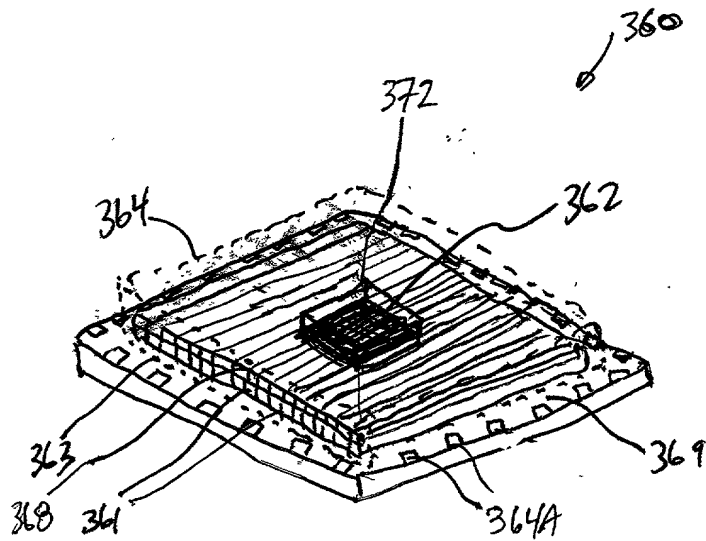


FIG. 38B

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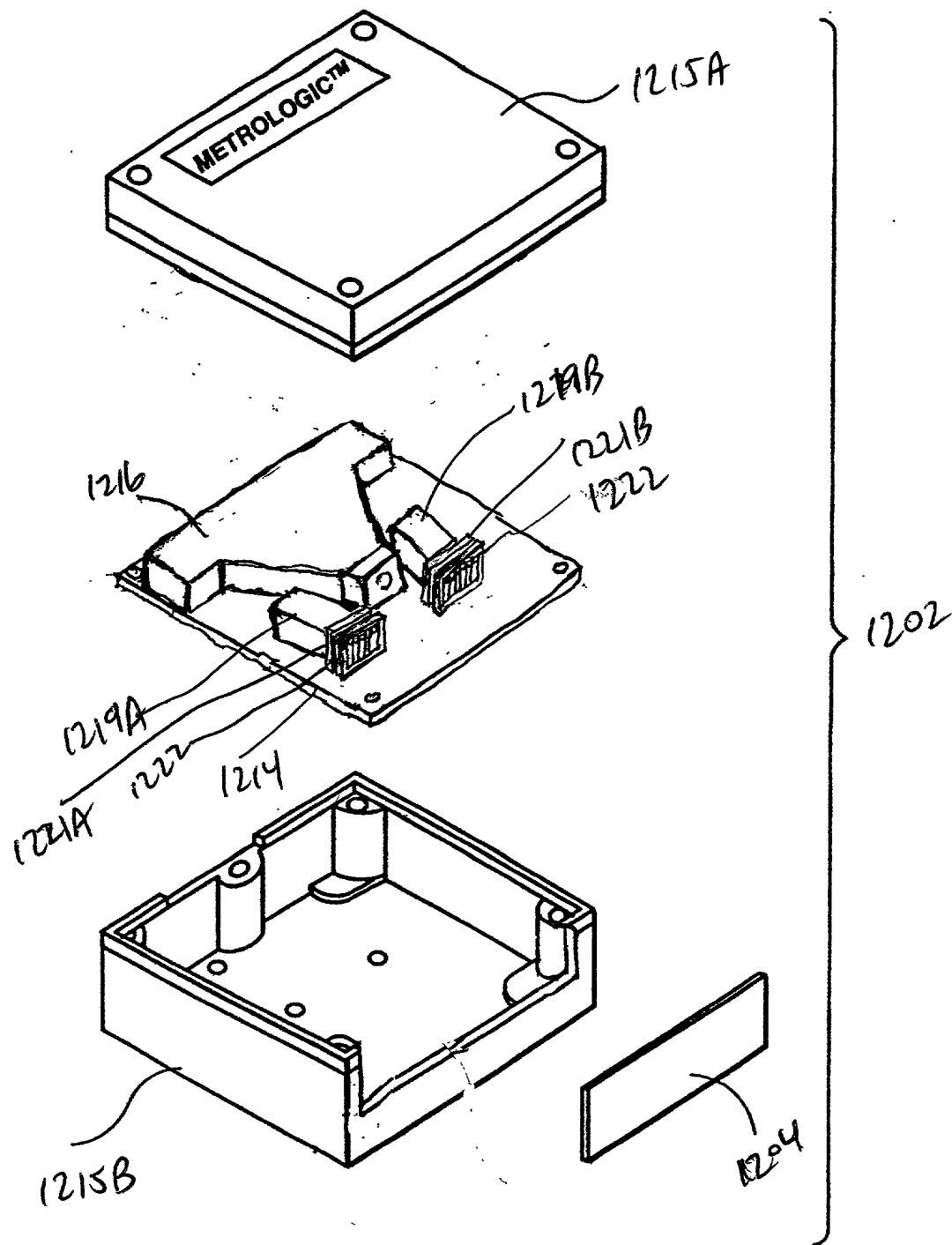


FIG. 39B

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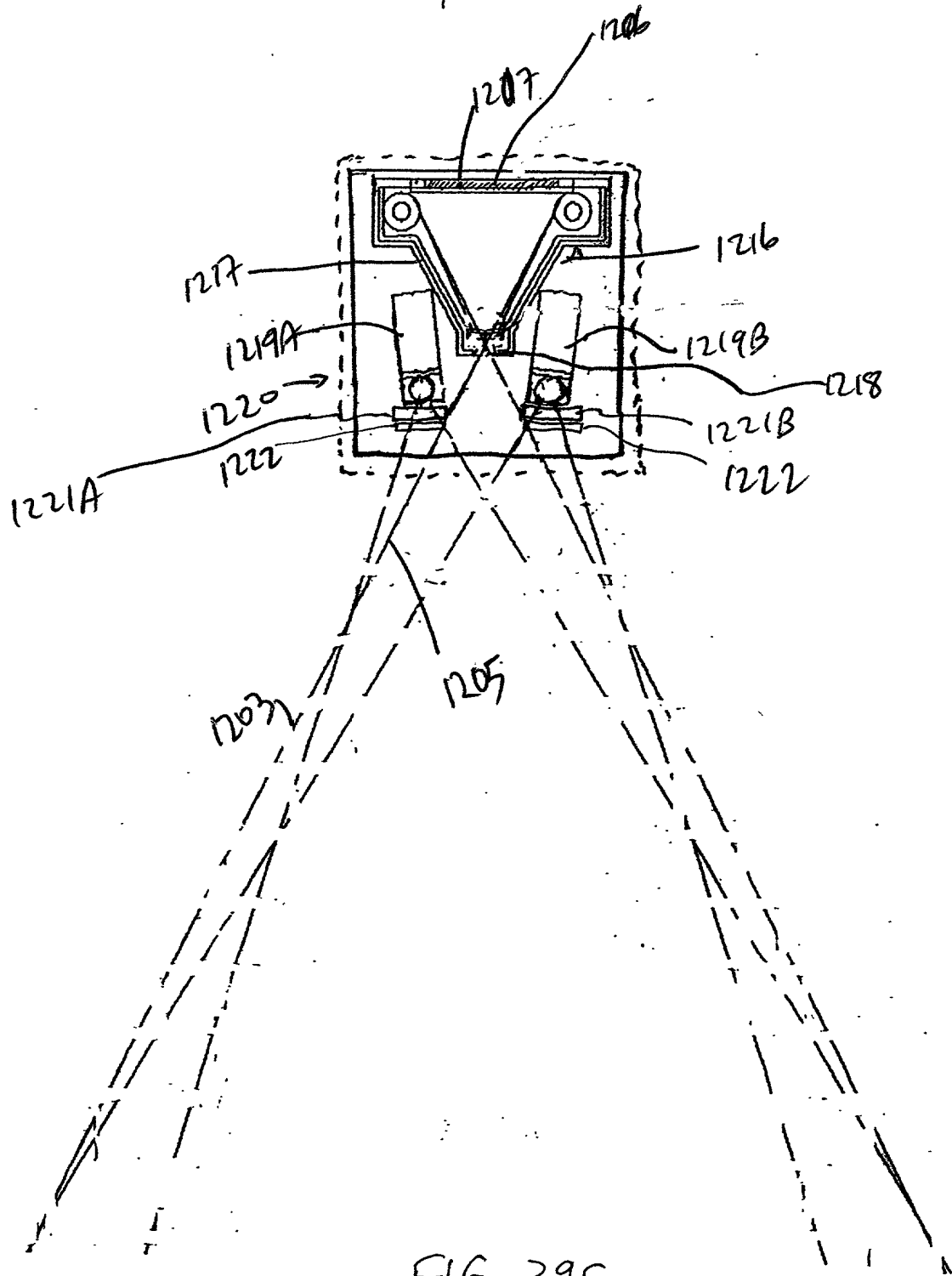


FIG. 39C

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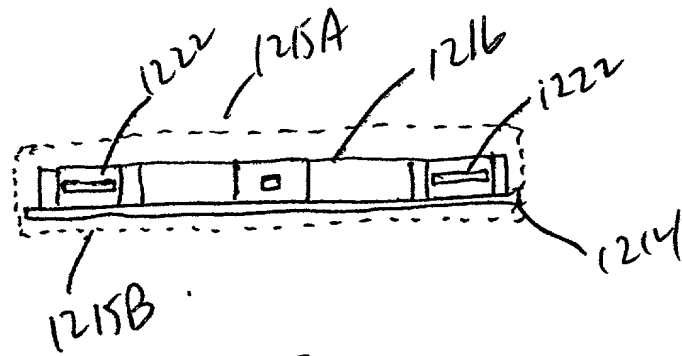


FIG. 39D

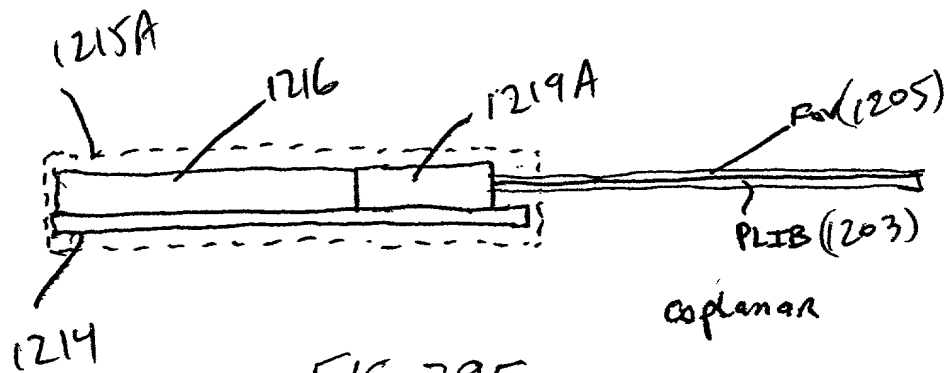


FIG. 39E

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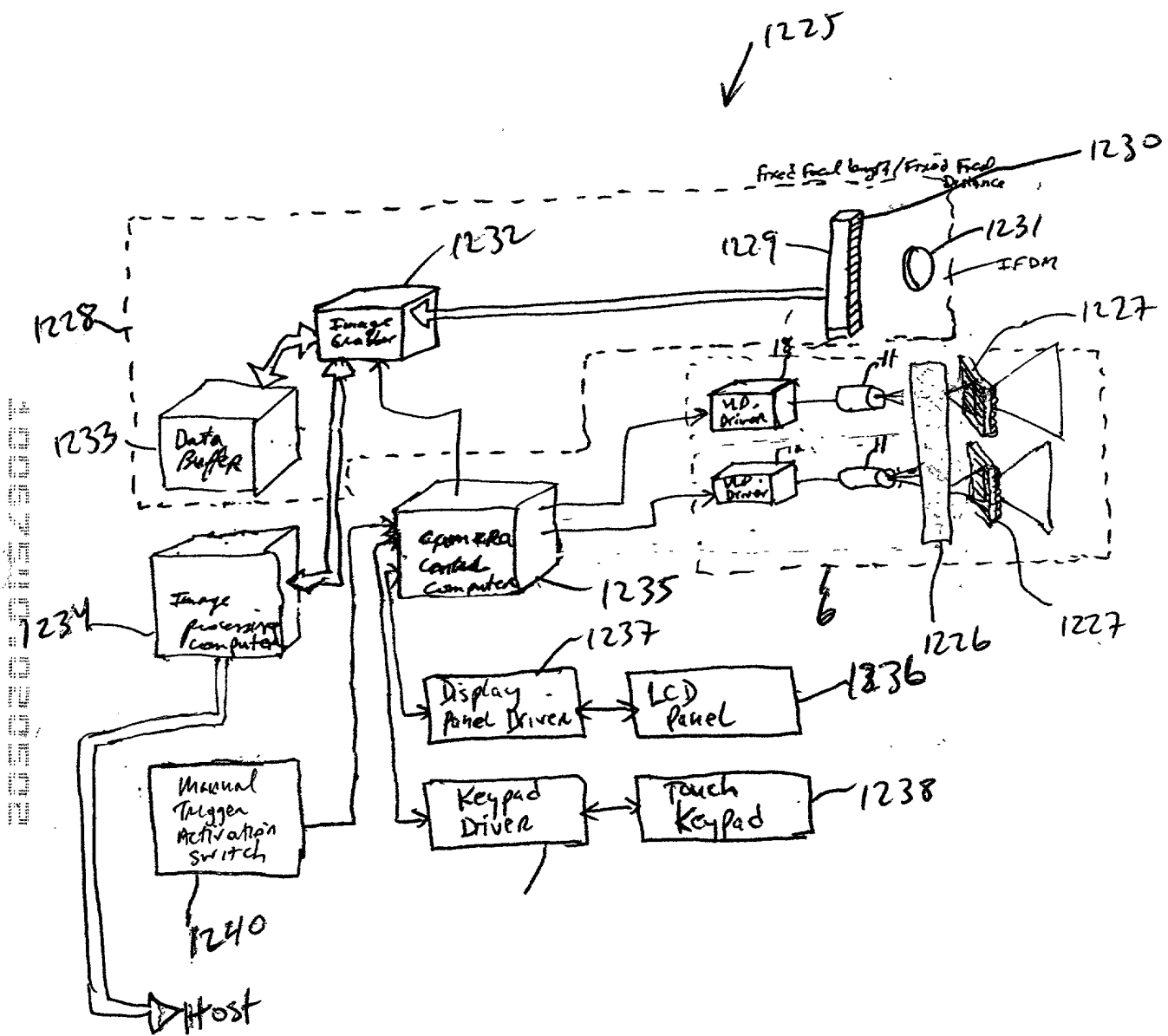


FIG. 40A1

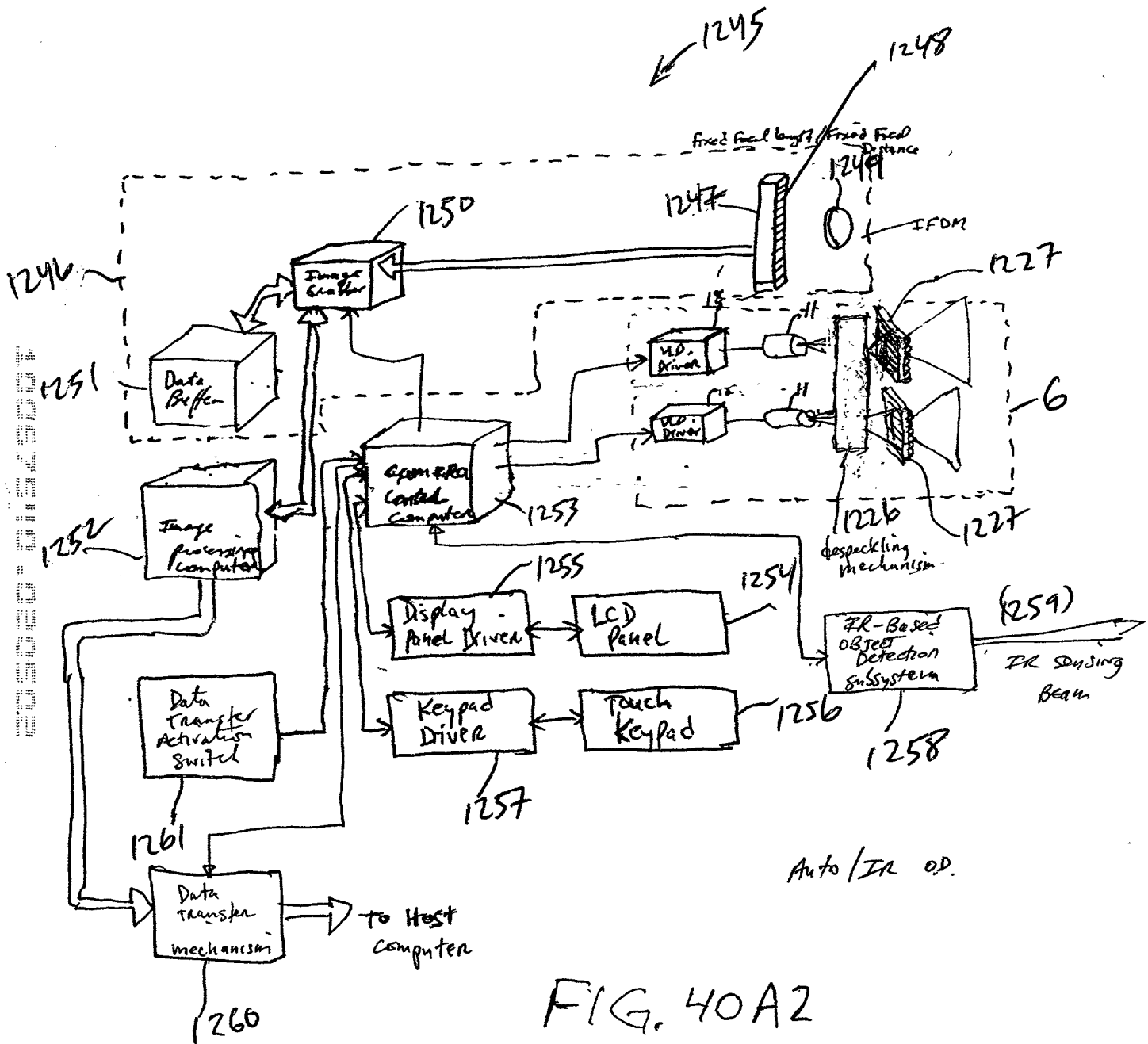
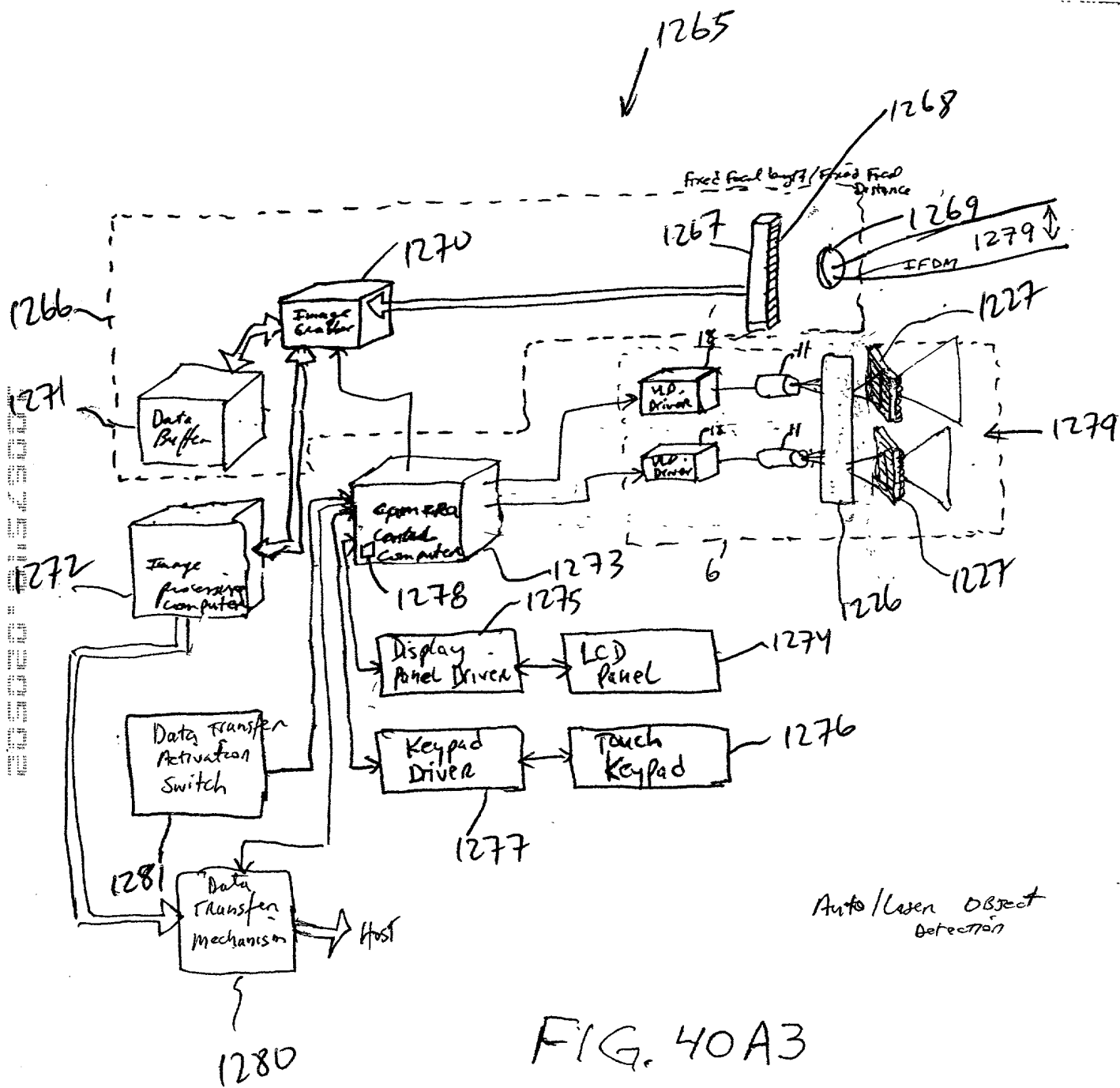
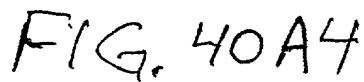
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FIG. 40A2

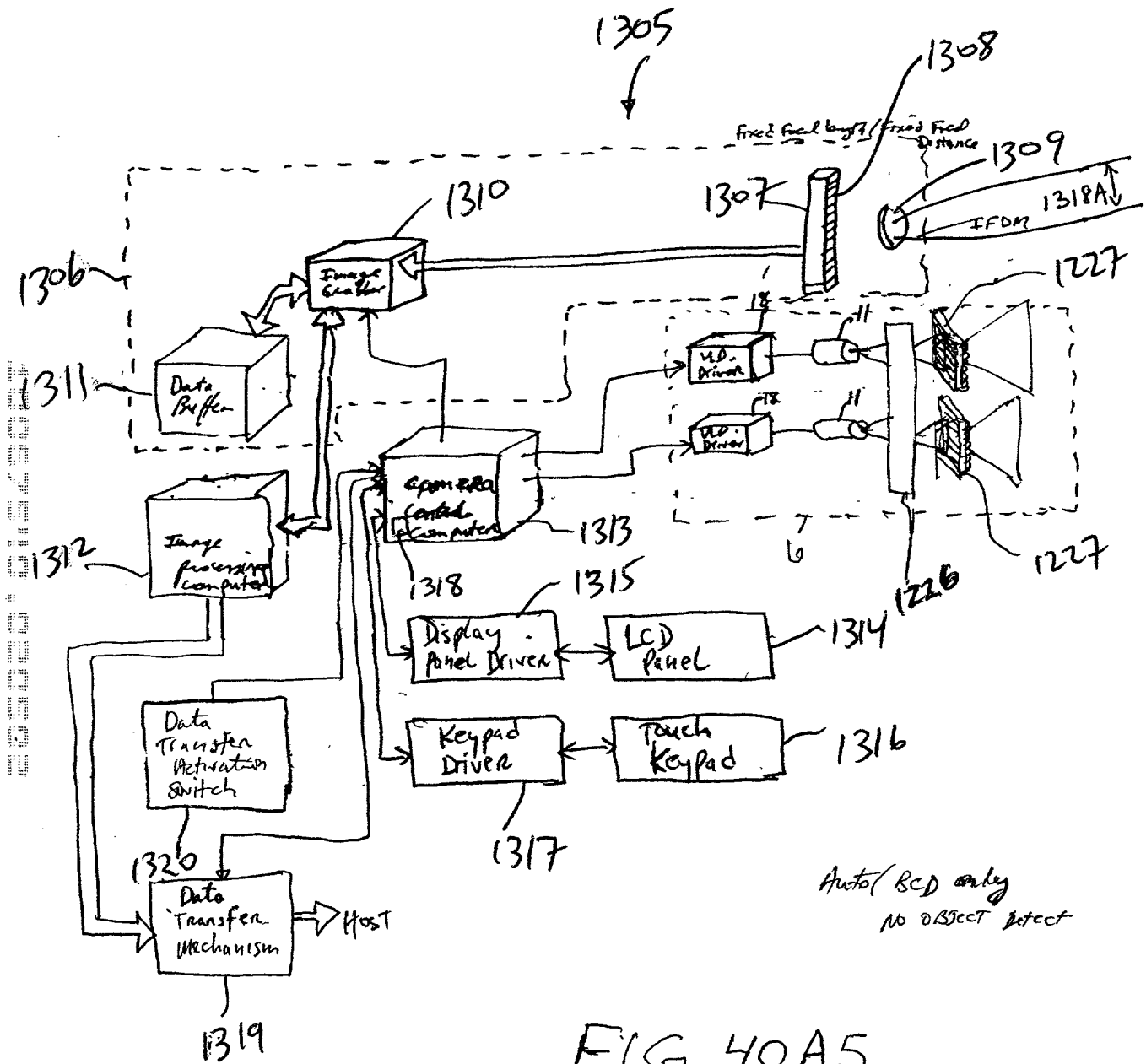
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SECRET



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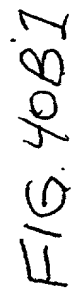
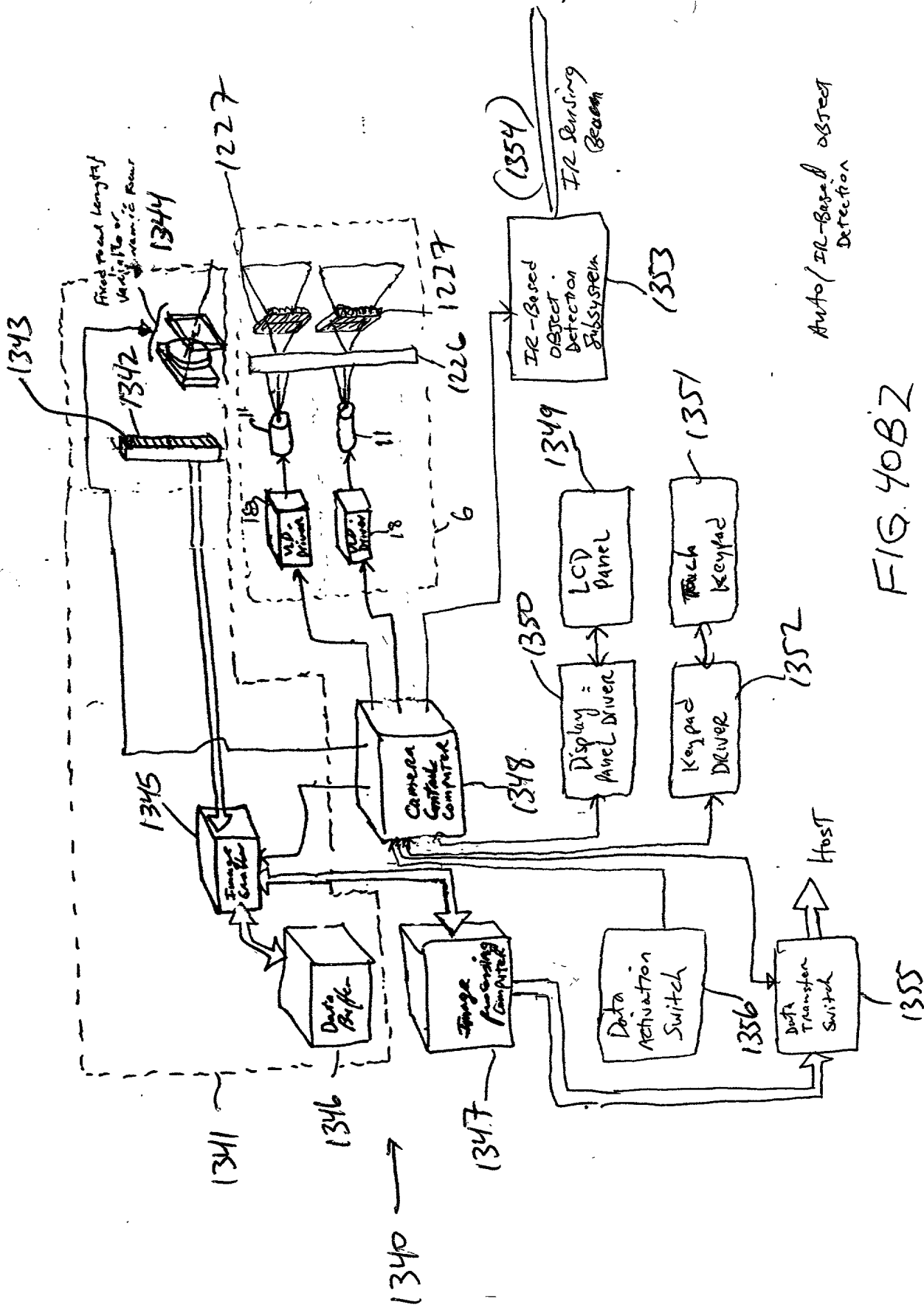
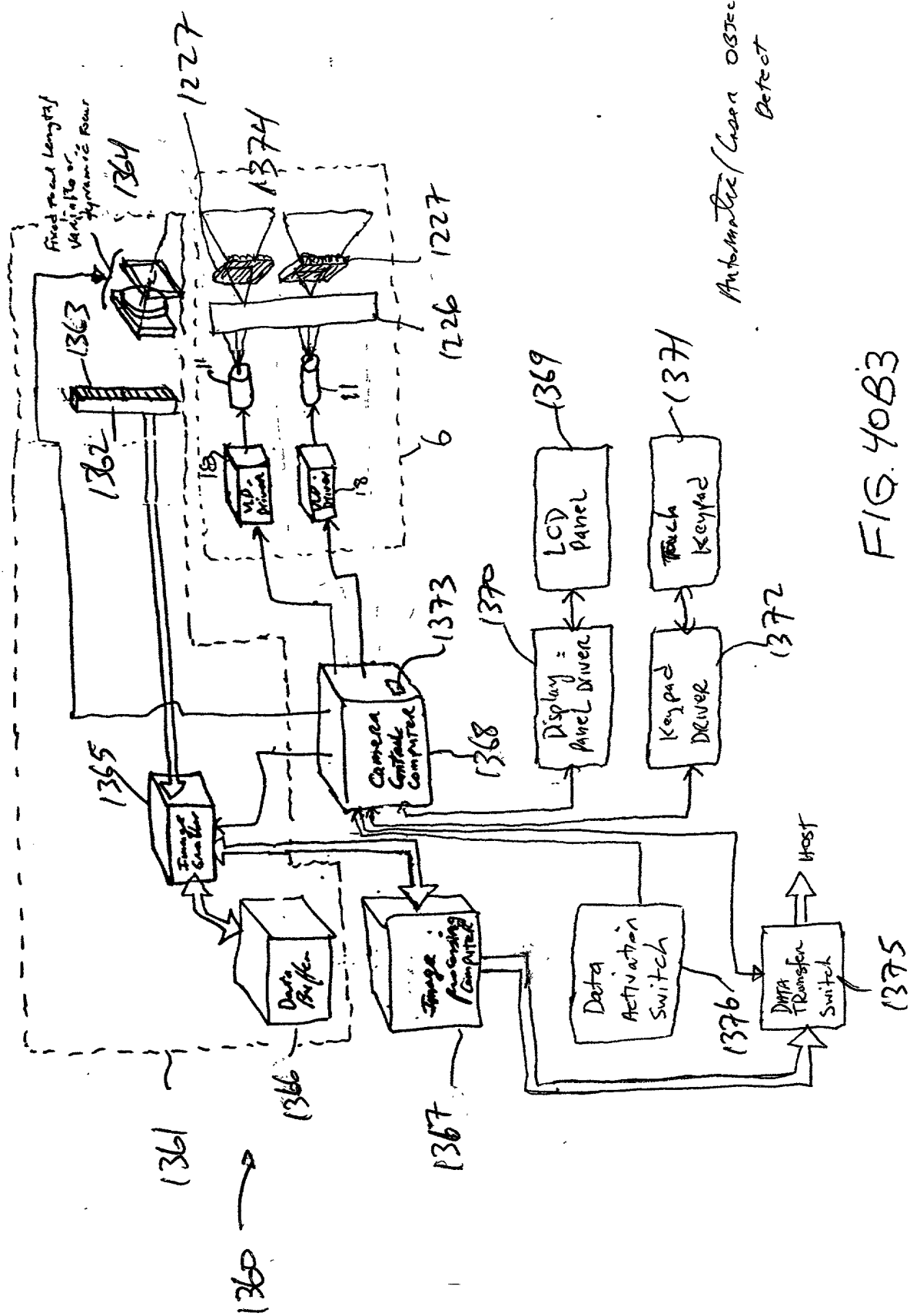


FIG. 40B1



Auto/IR-based object
Detection

FIG. 40B2



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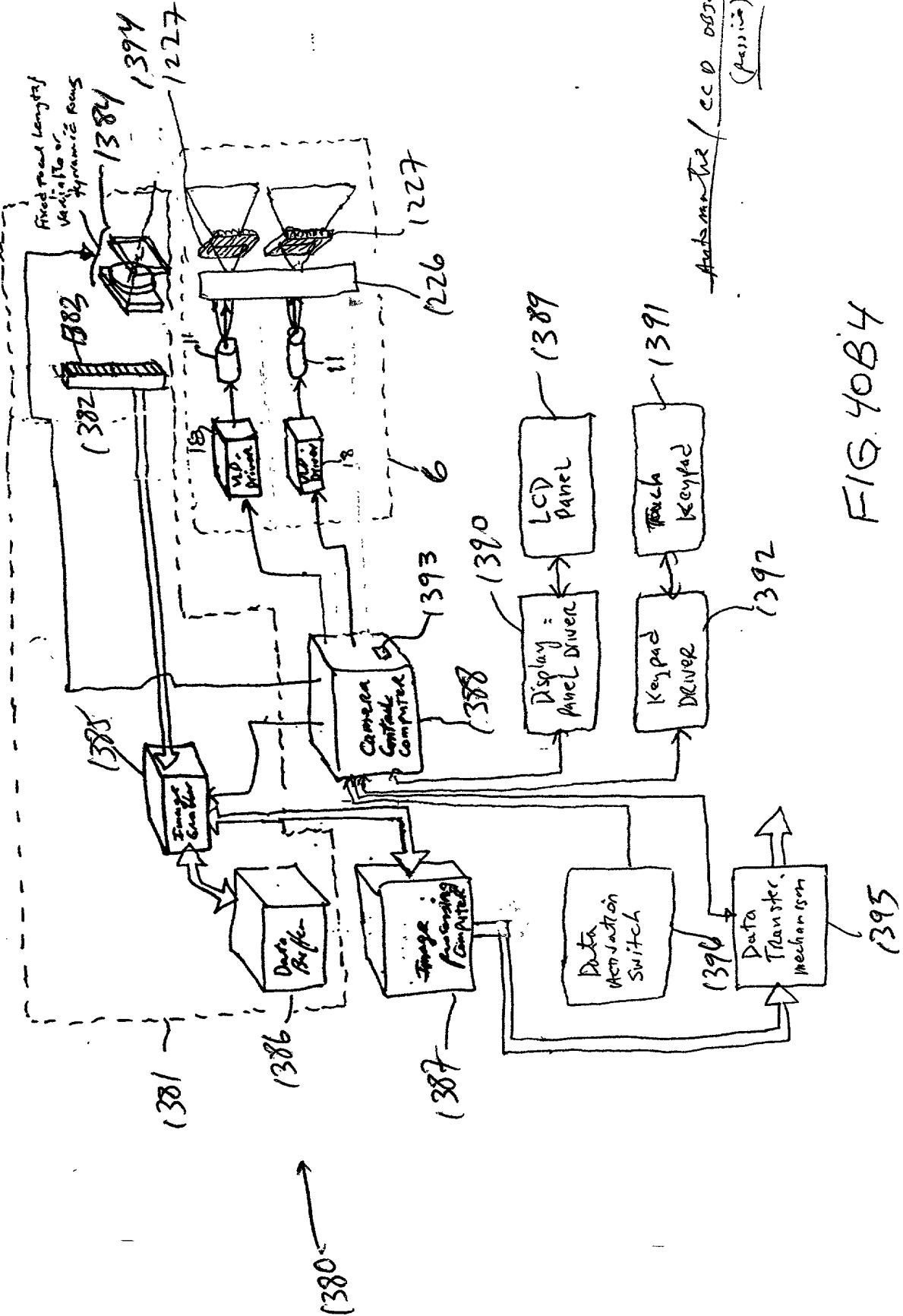
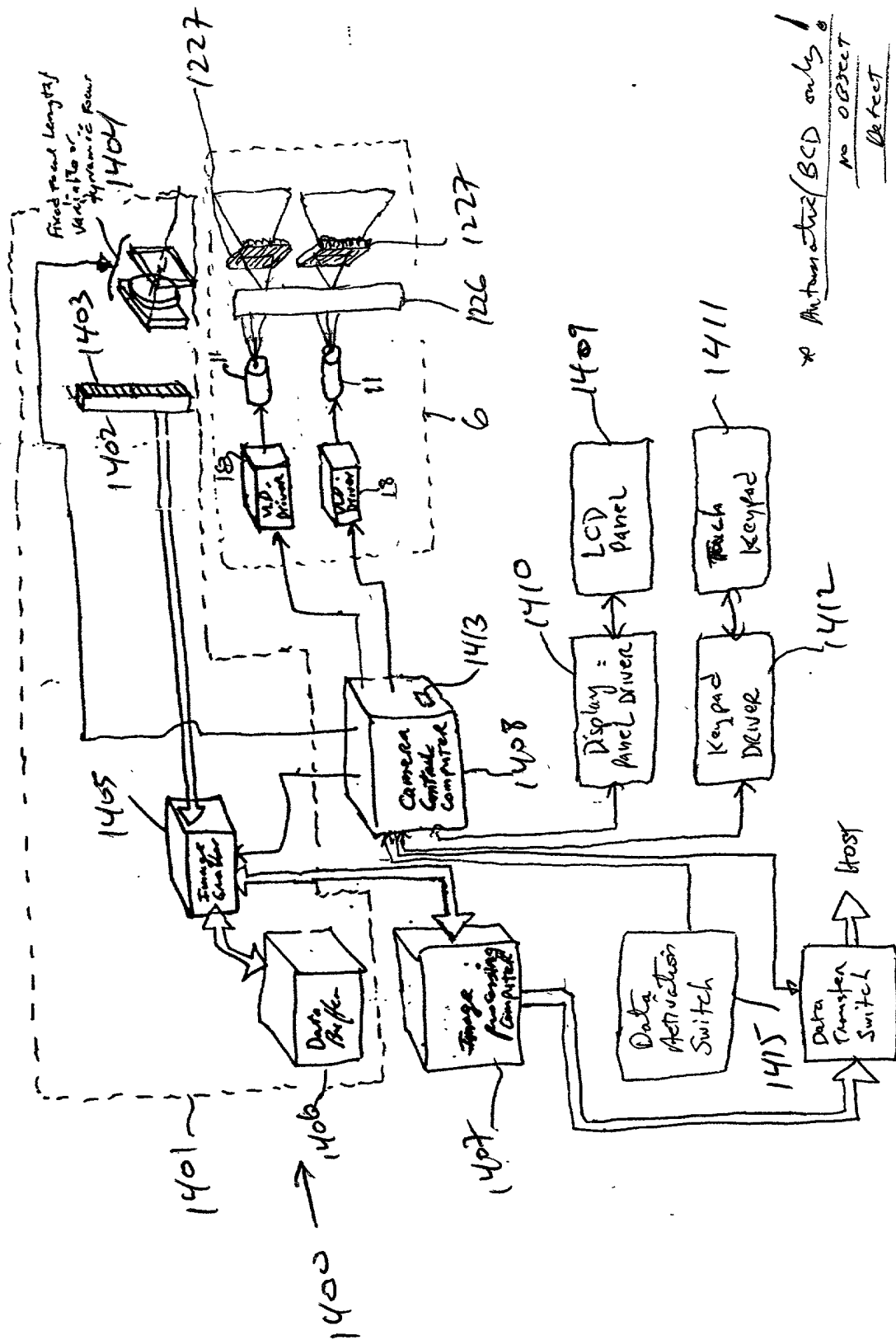


FIG. 40B4

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* Automated/BCD only
No Object
Detect

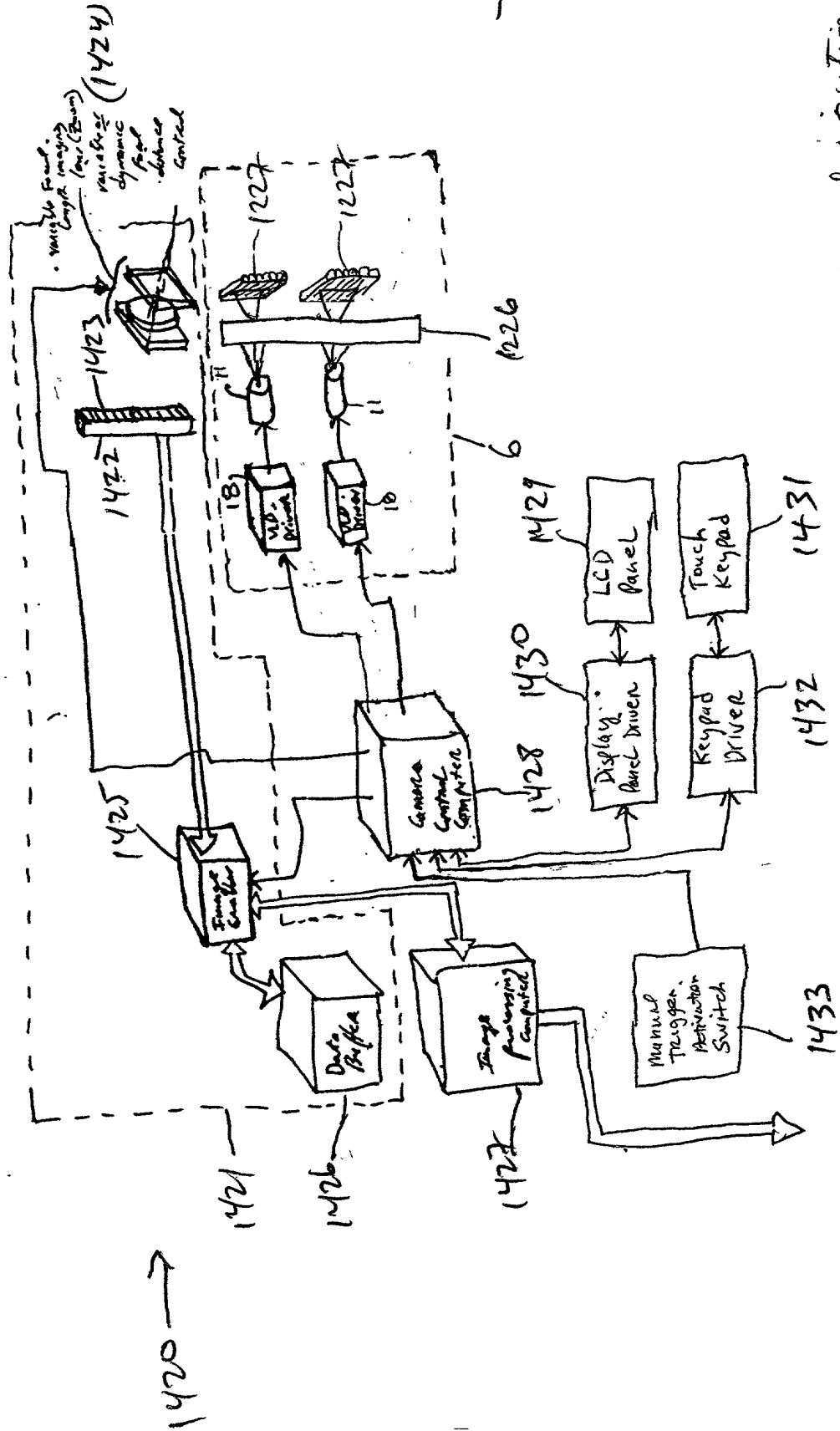
FIG. 40B5

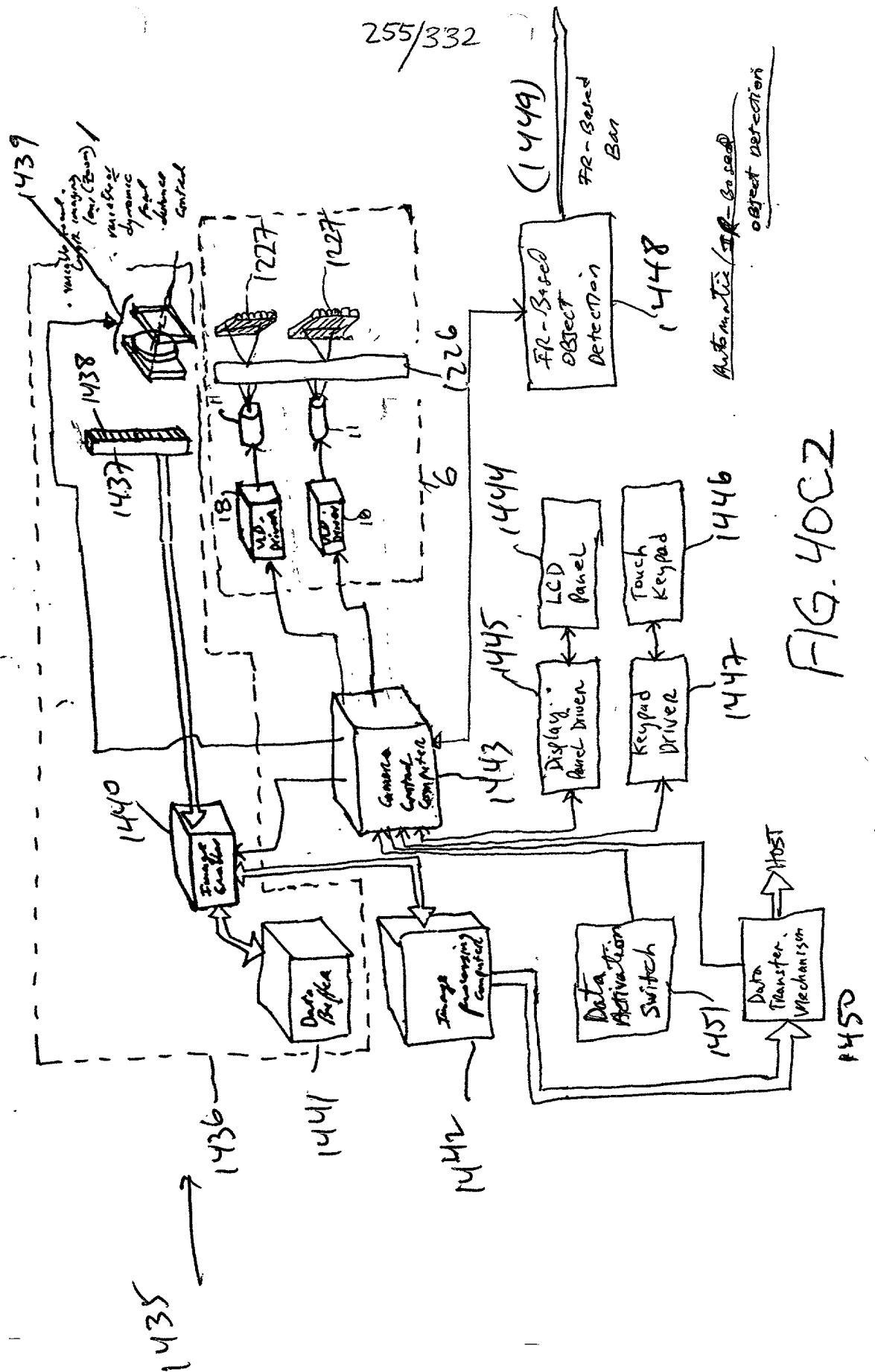
1414

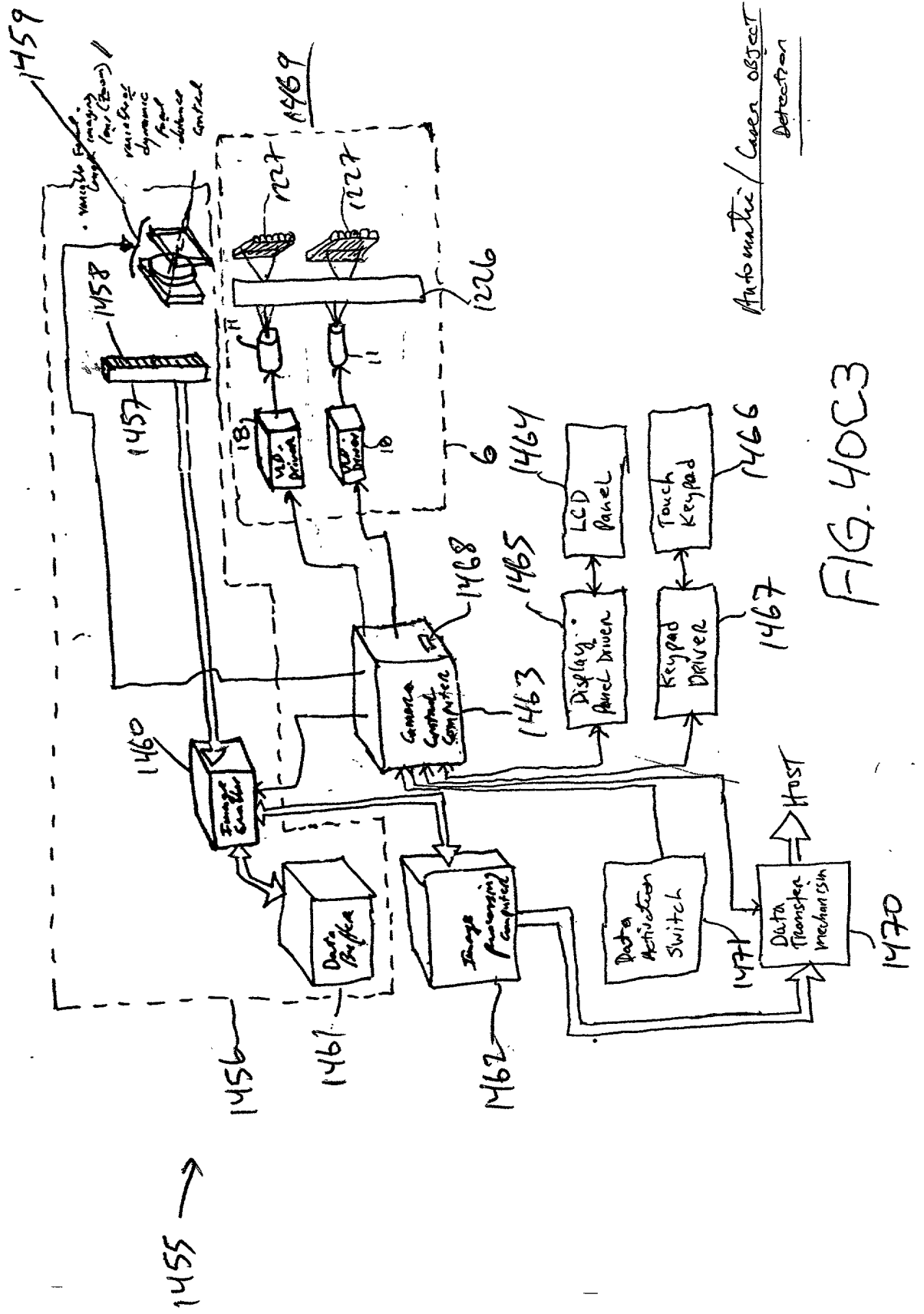
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Manual Activation

FIG. 40C1



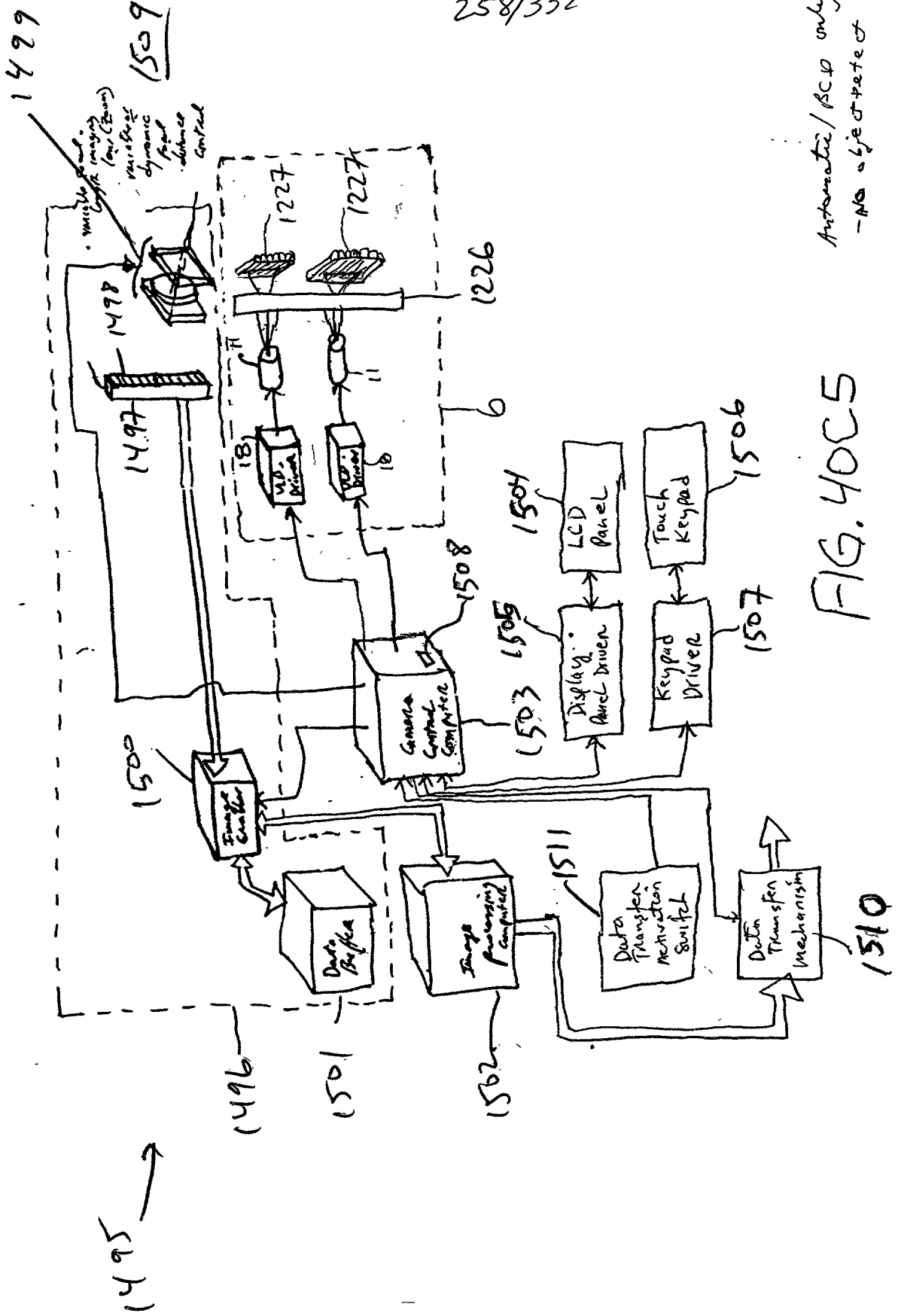






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Automatic/PCD only
- no object detect



1-D
desp. v. v. v.
v. v. v. v. v.

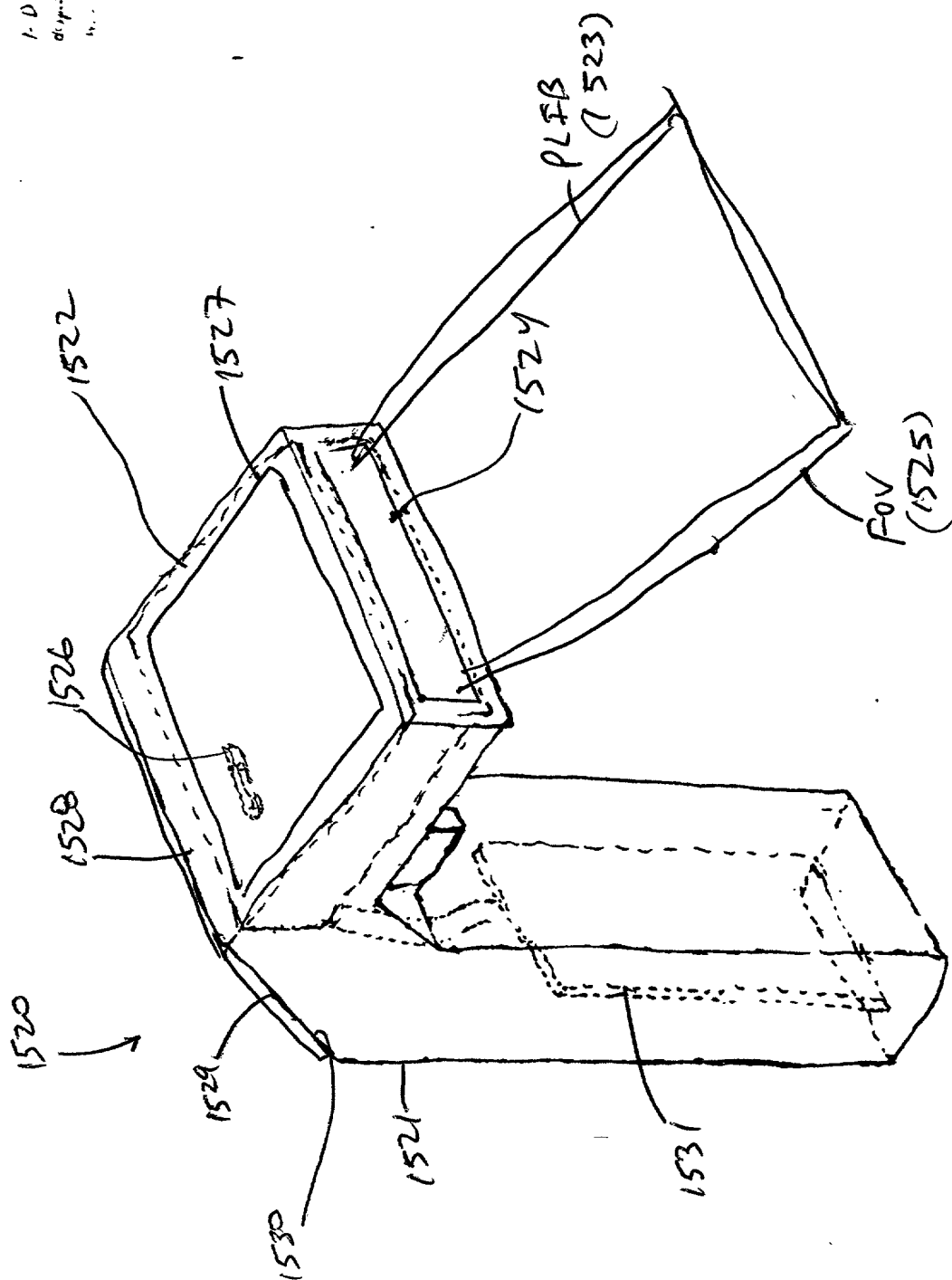


FIG. 41A

Host Computer/Network

Data Comm.
Link

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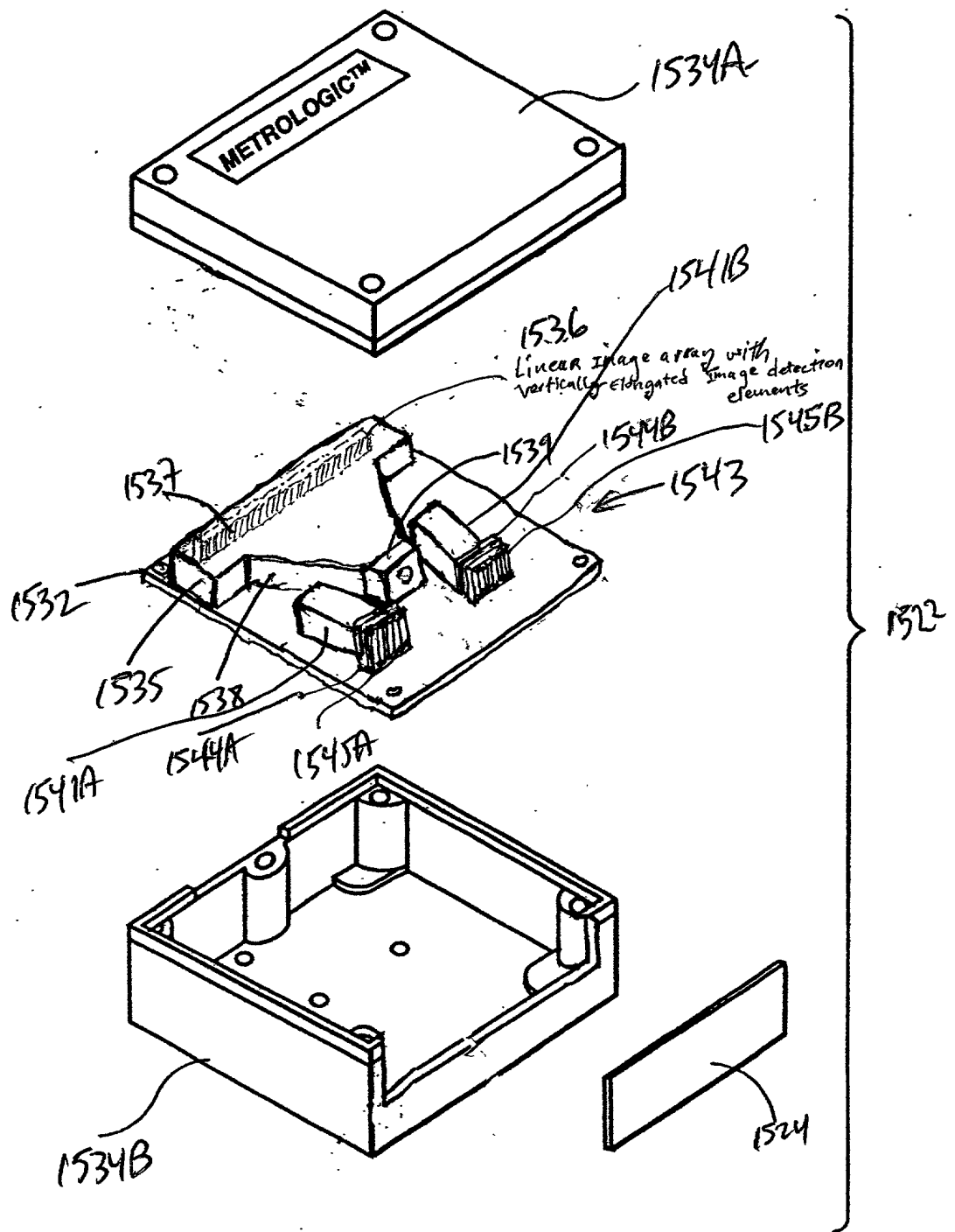


FIG. 41B

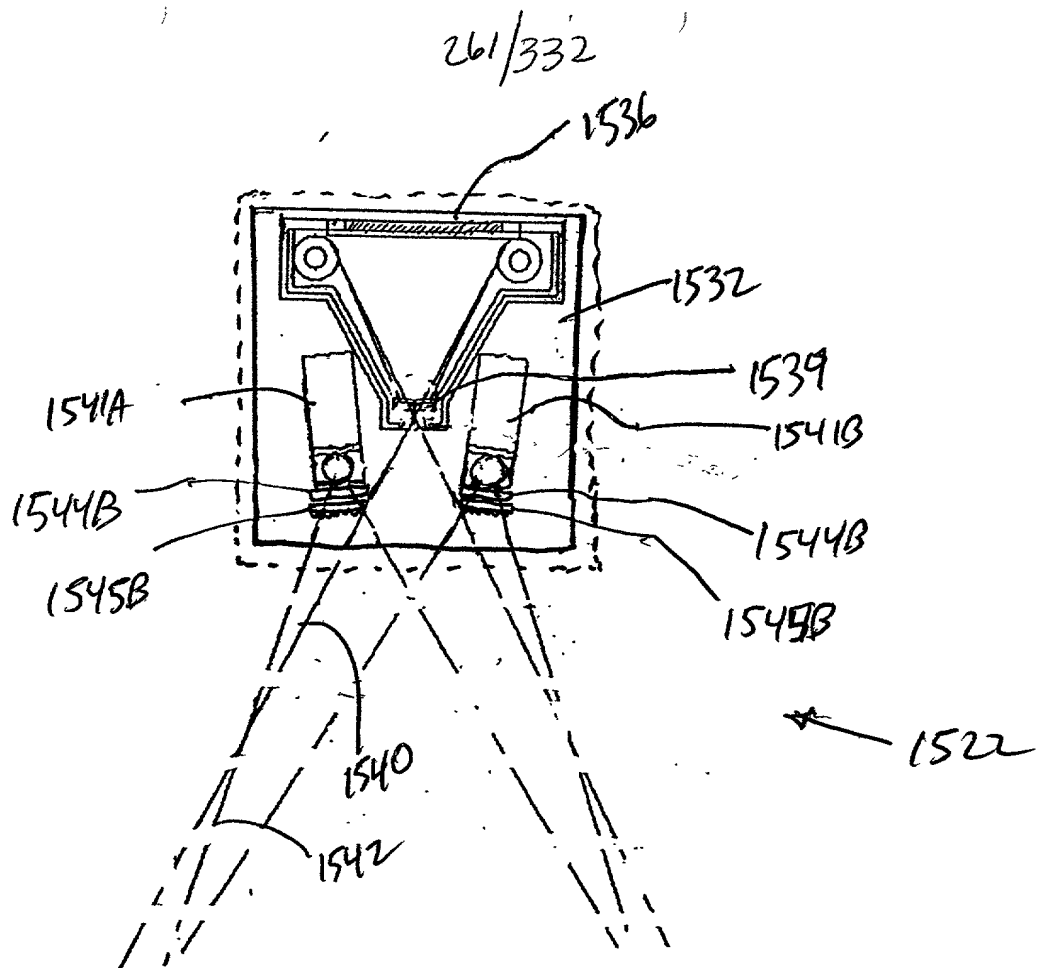


FIG. 41C

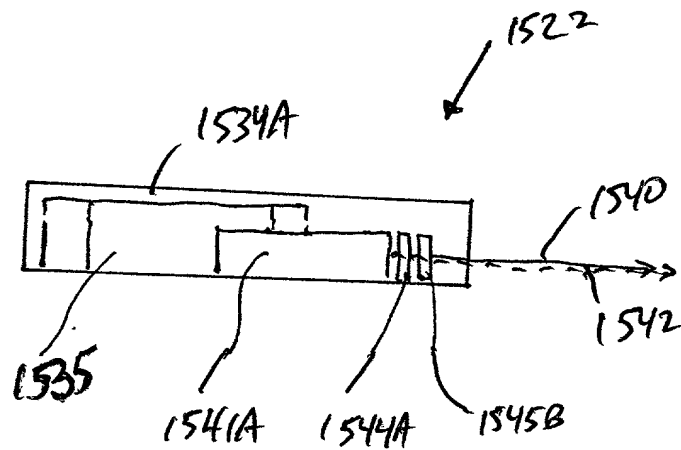
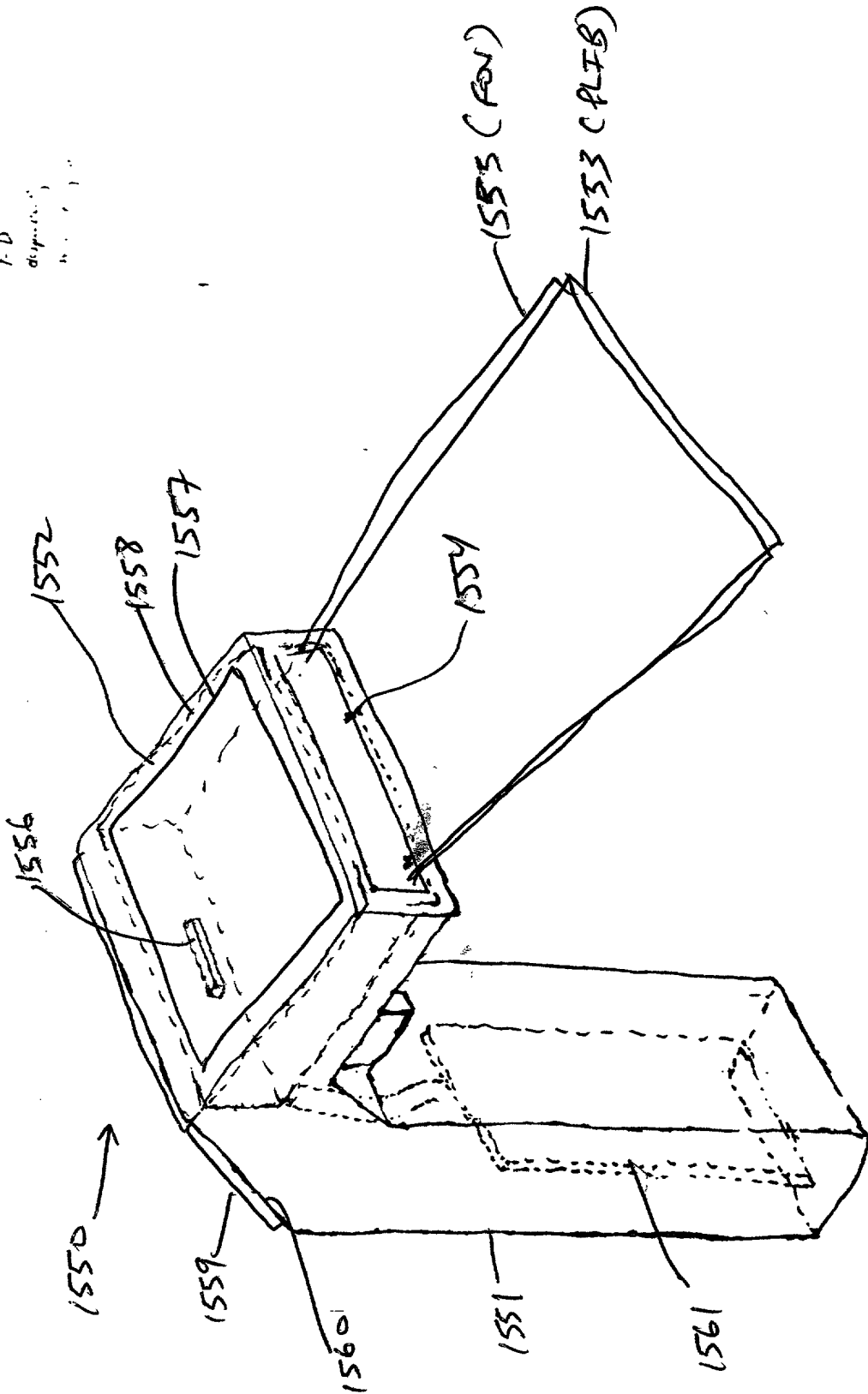


FIG. 41D

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1-D
display



1562 Data Comm.
Link



1563 Host Computer/Network

FIG. 42A

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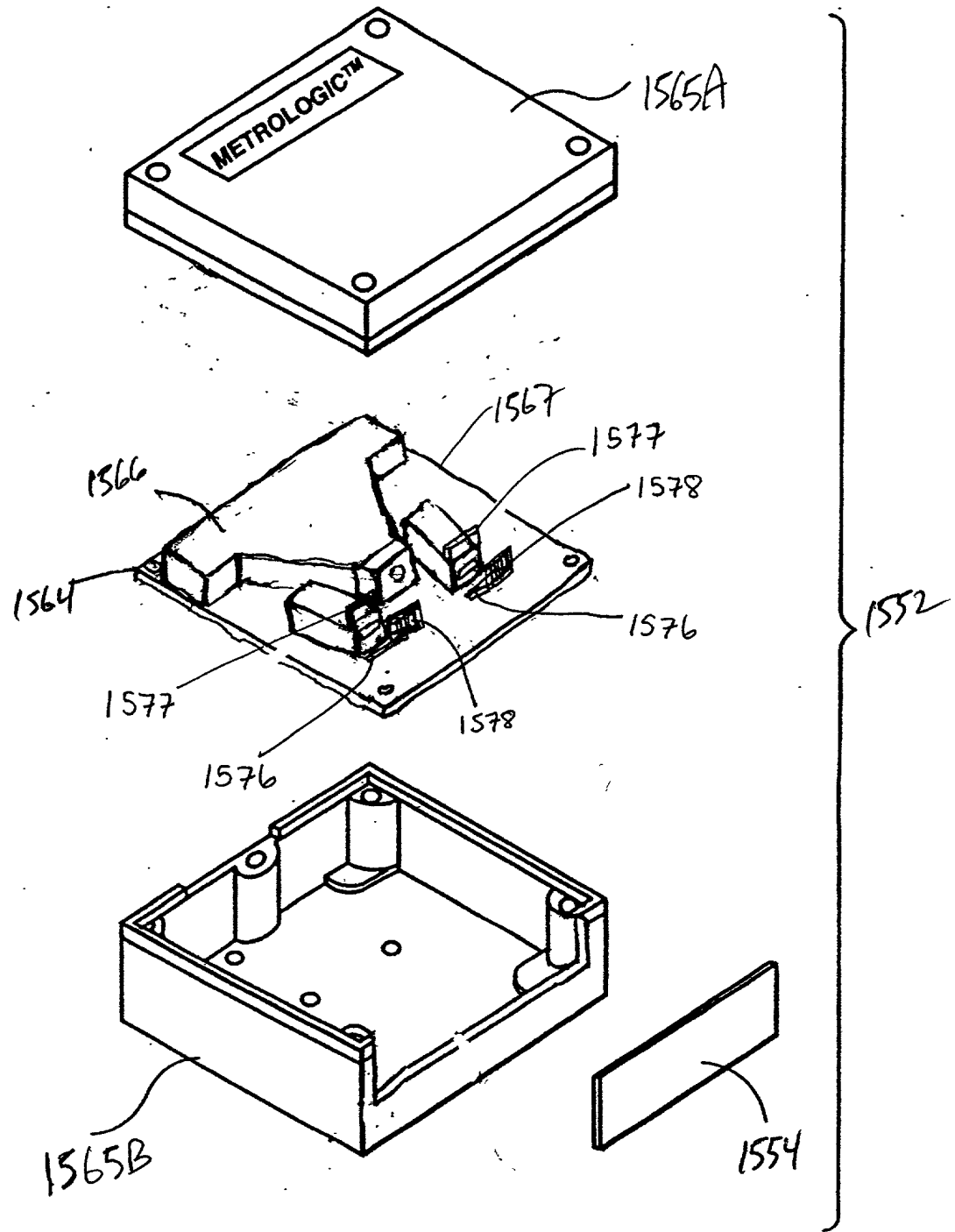


FIG. 42B

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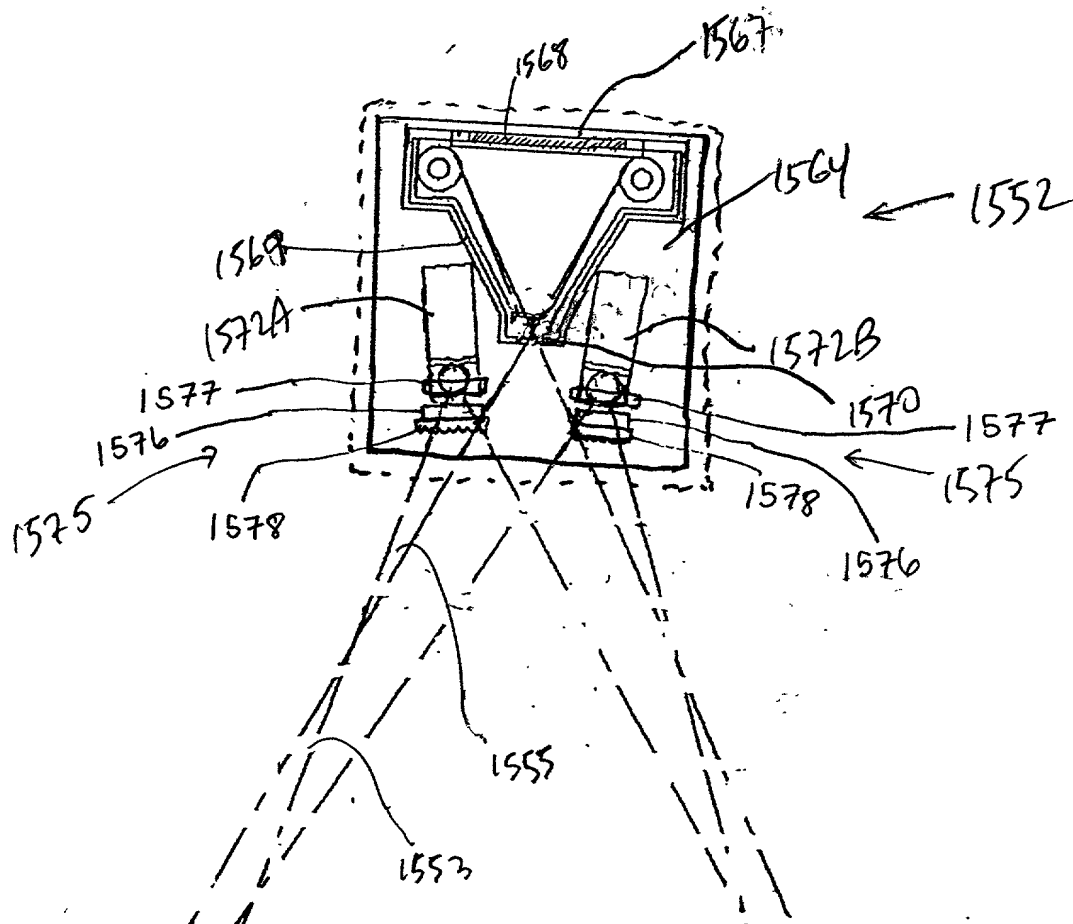


FIG. 42C

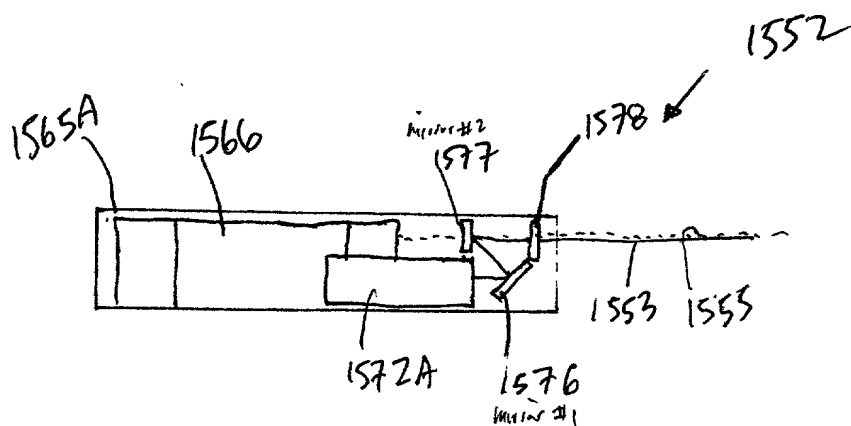


FIG. 42D

1-D
displacement
in x, y, z

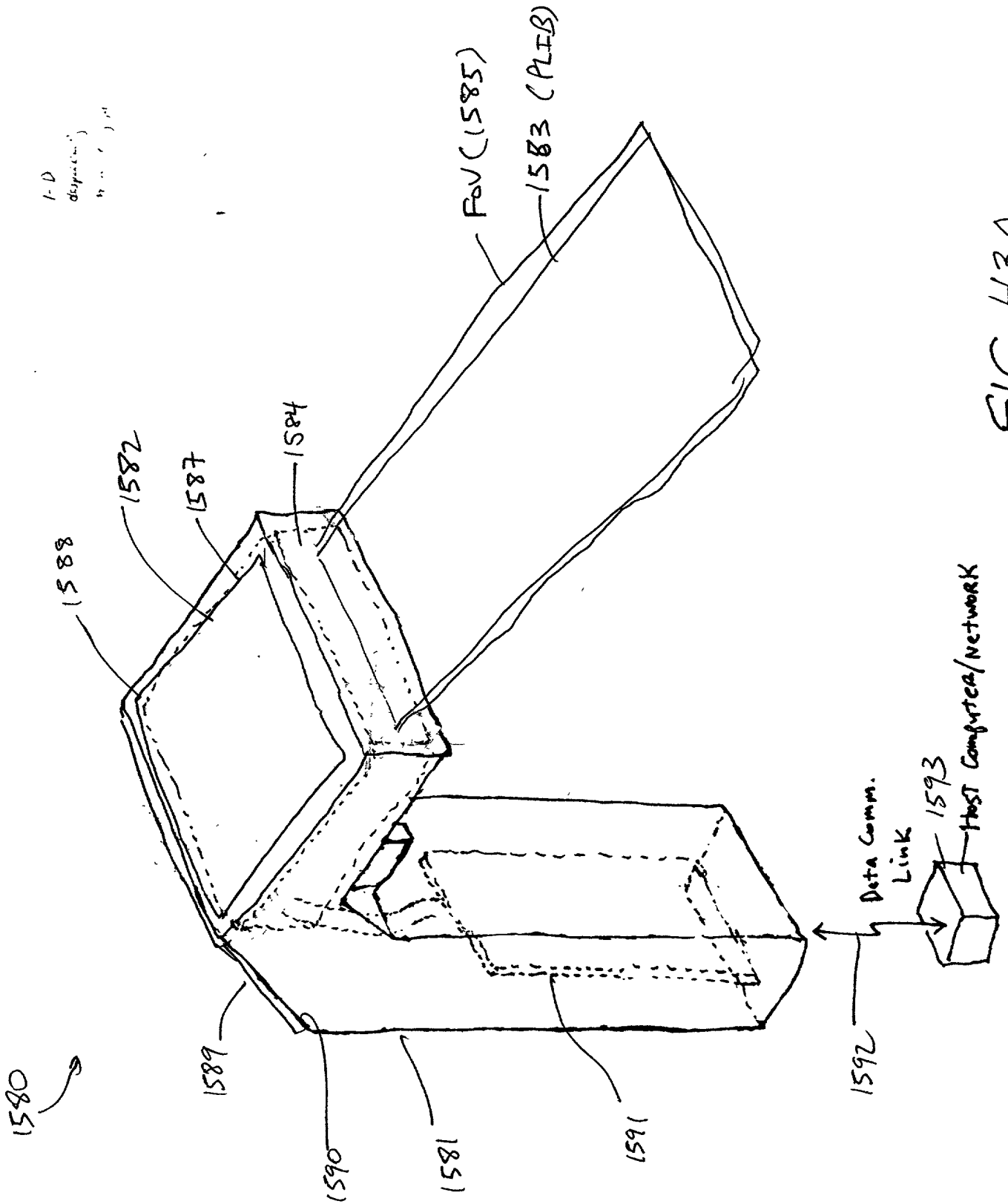


FIG. 43A

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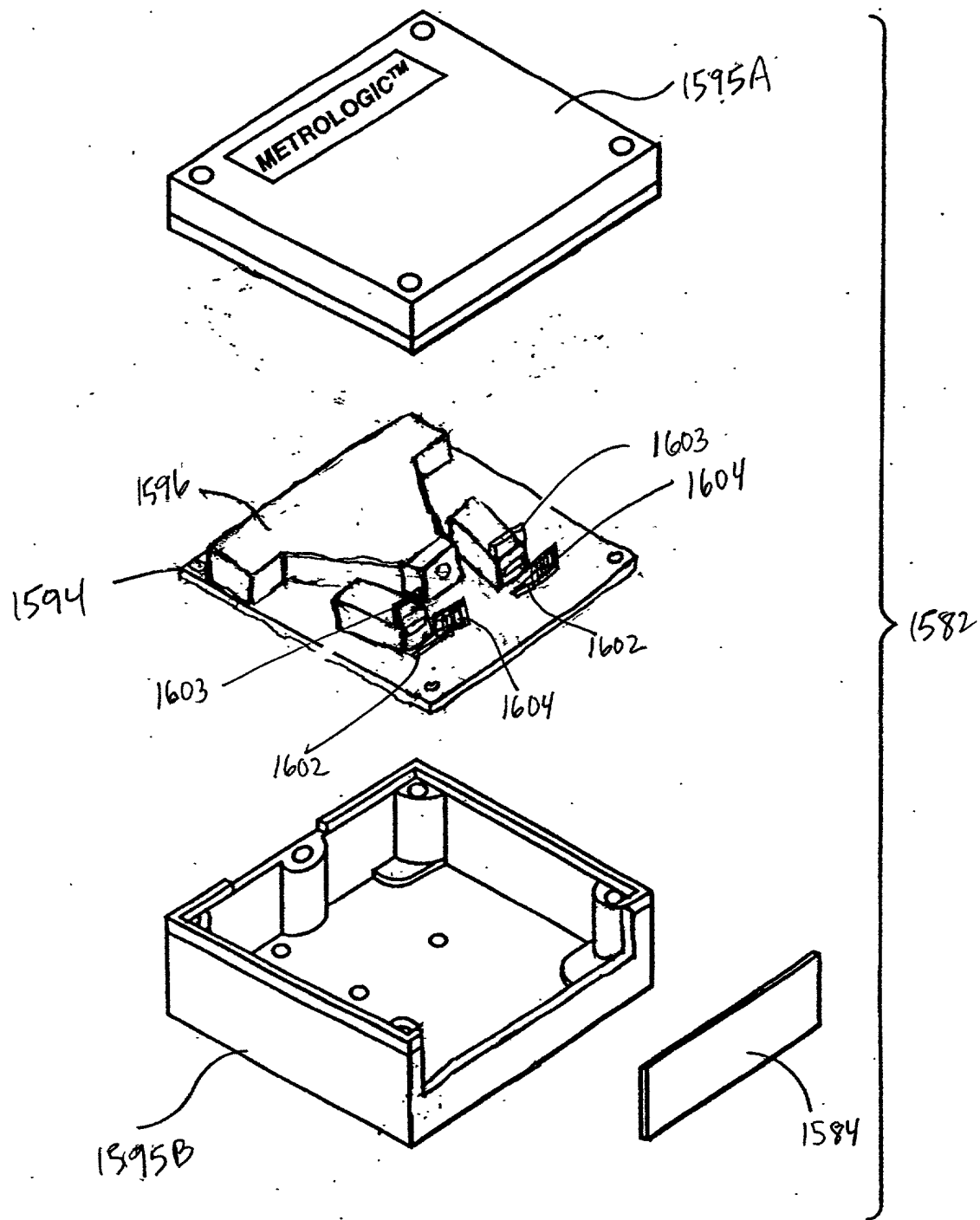


FIG. 43B

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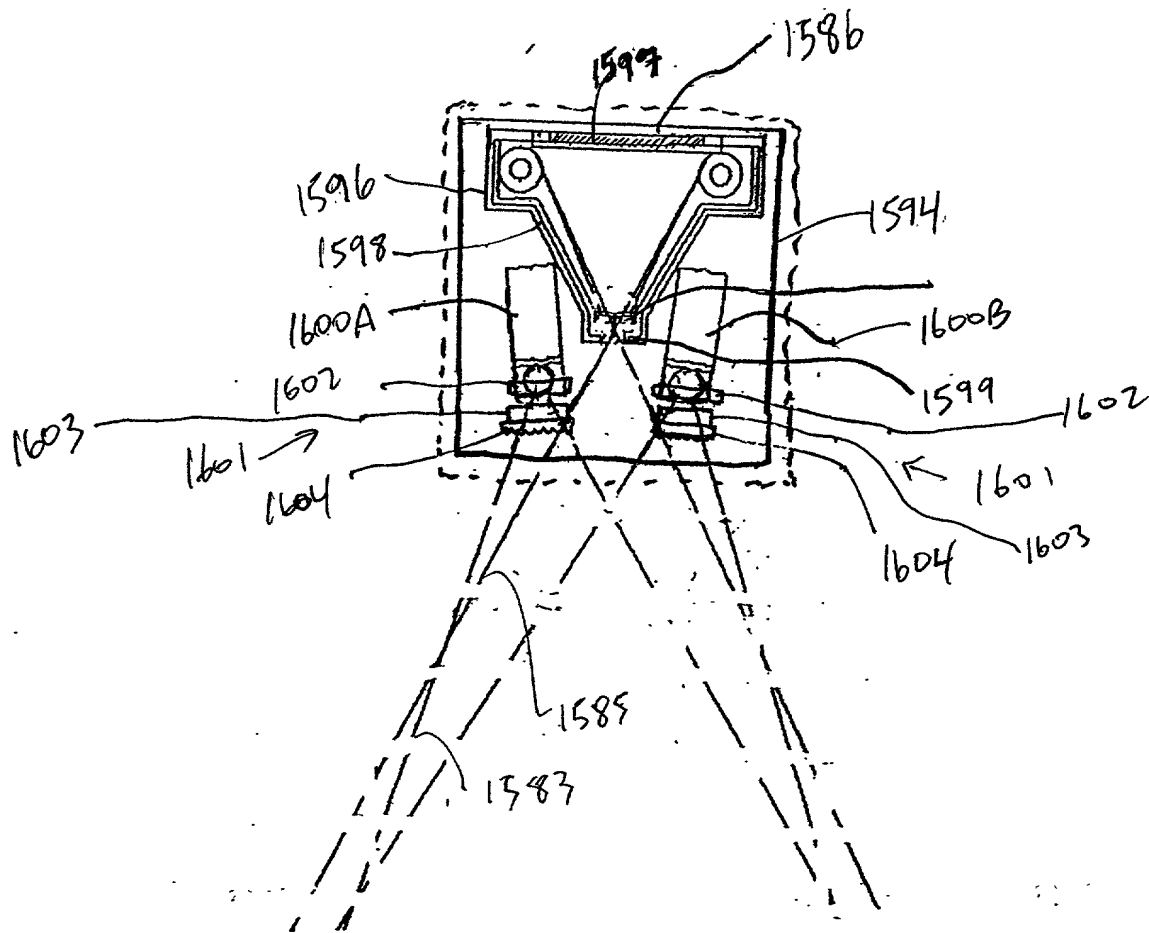


FIG. 43C

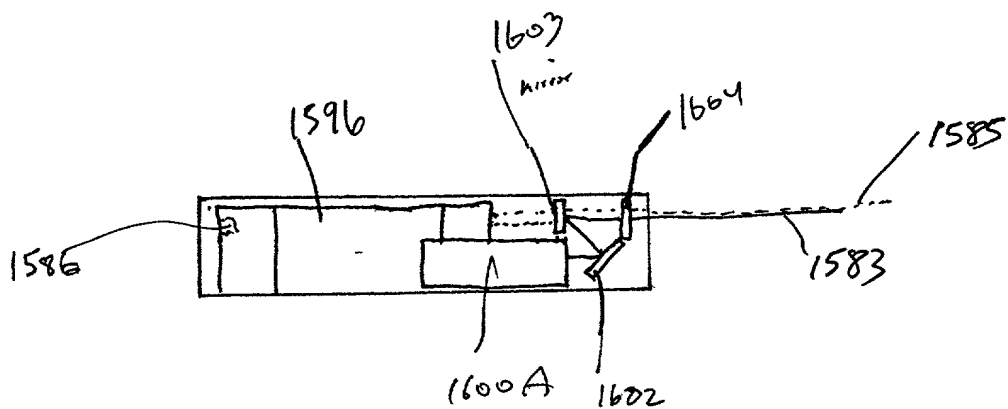


FIG. 43D

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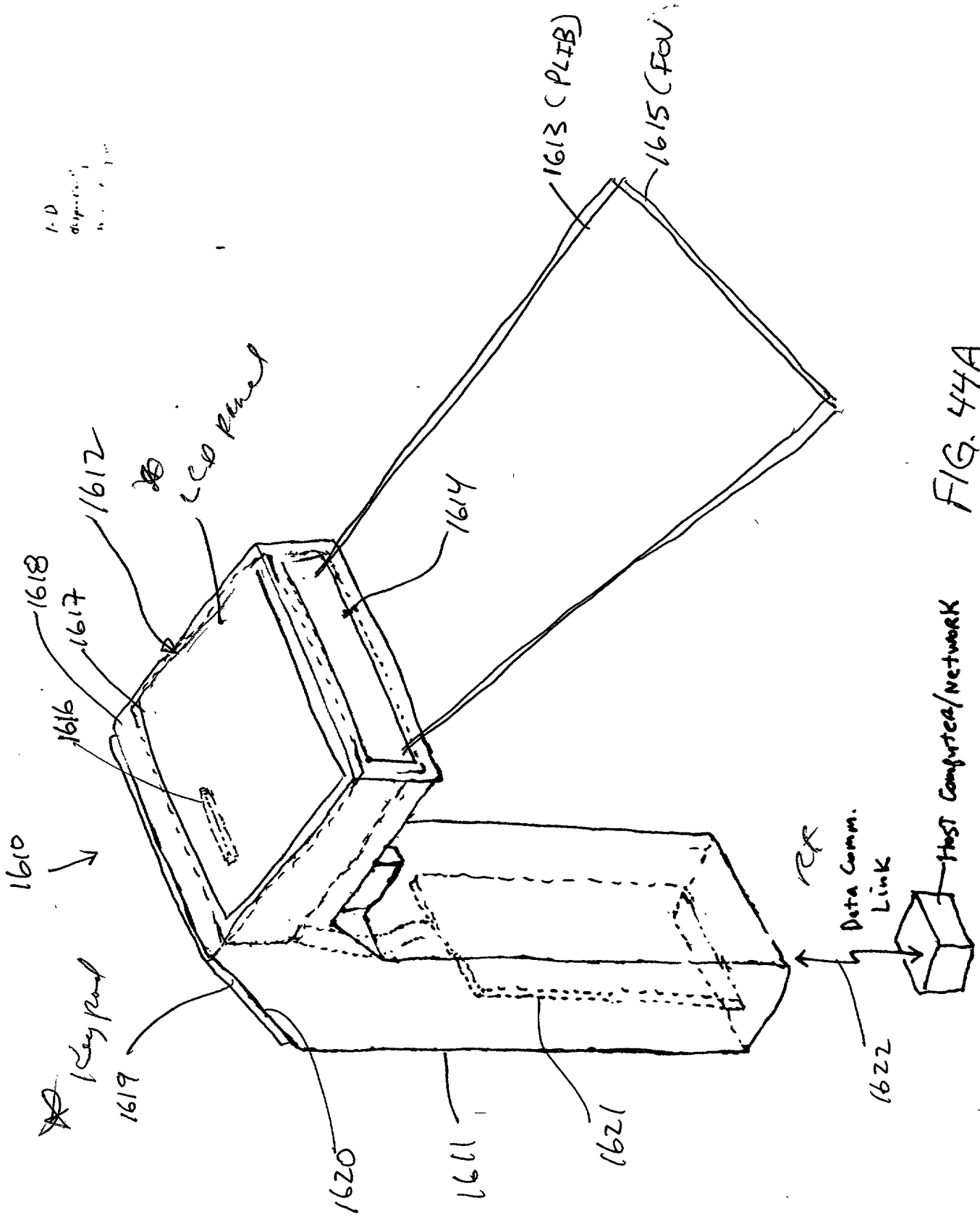


FIG. 44A

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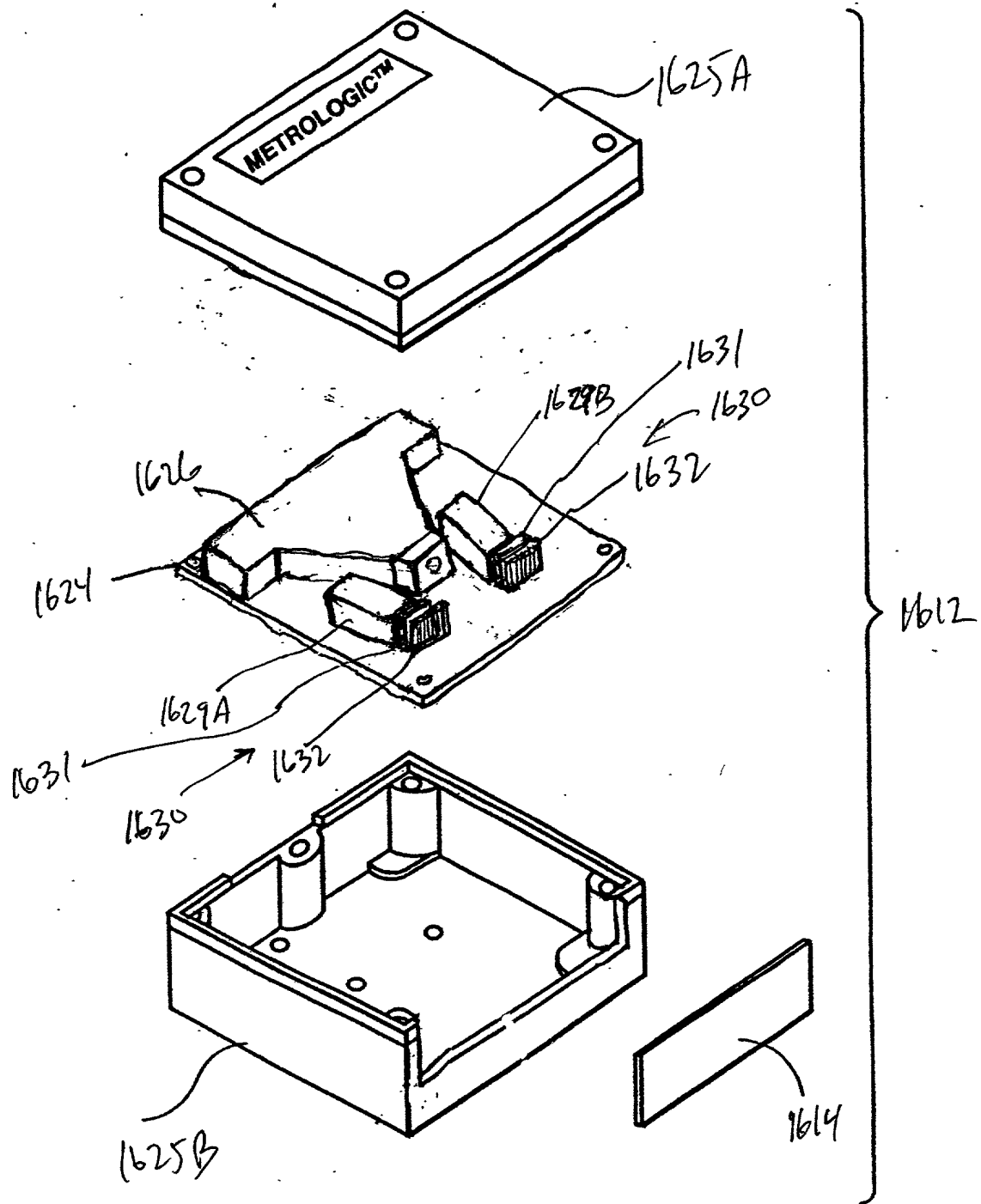
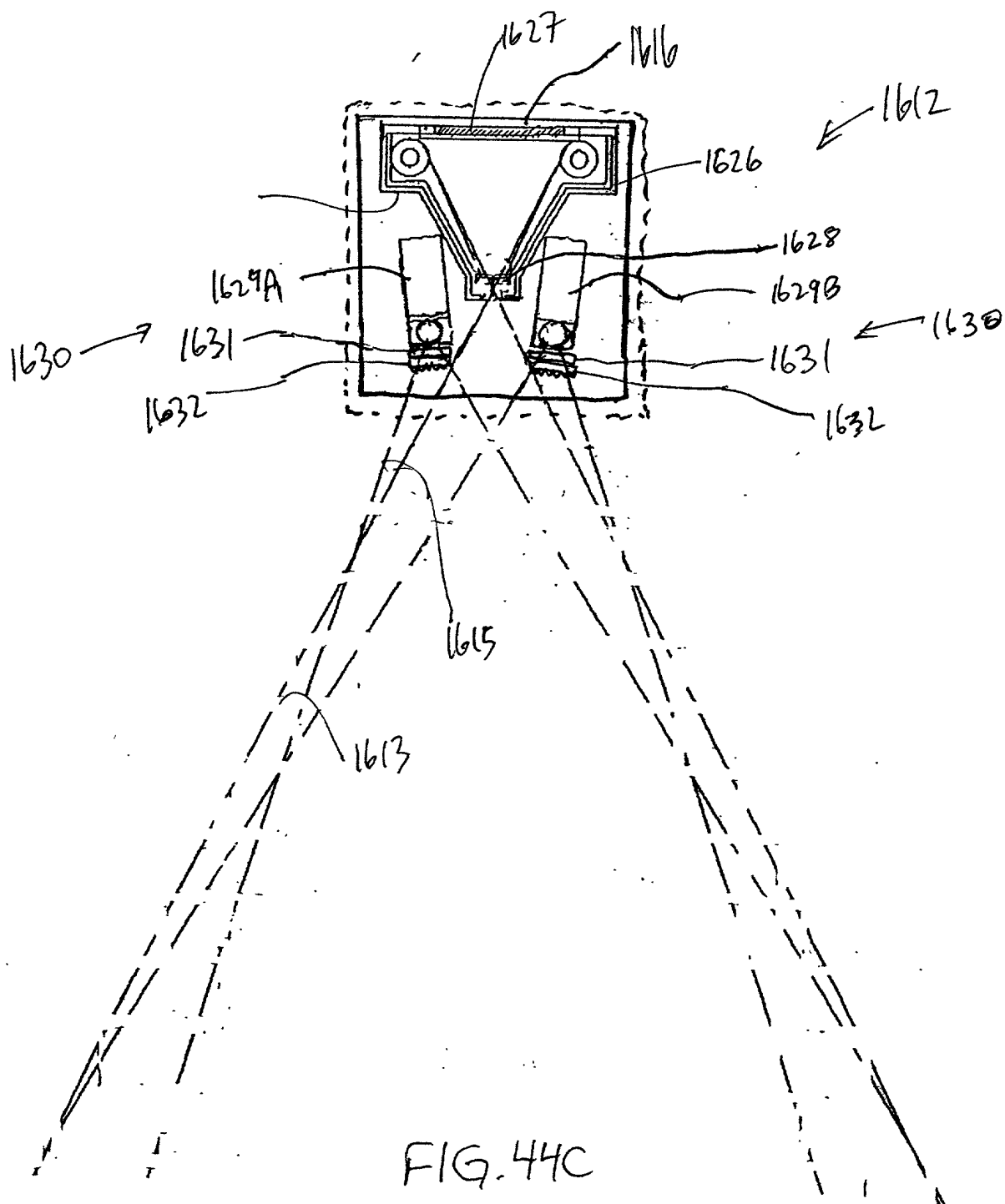


FIG. 44B

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1-D
desperately

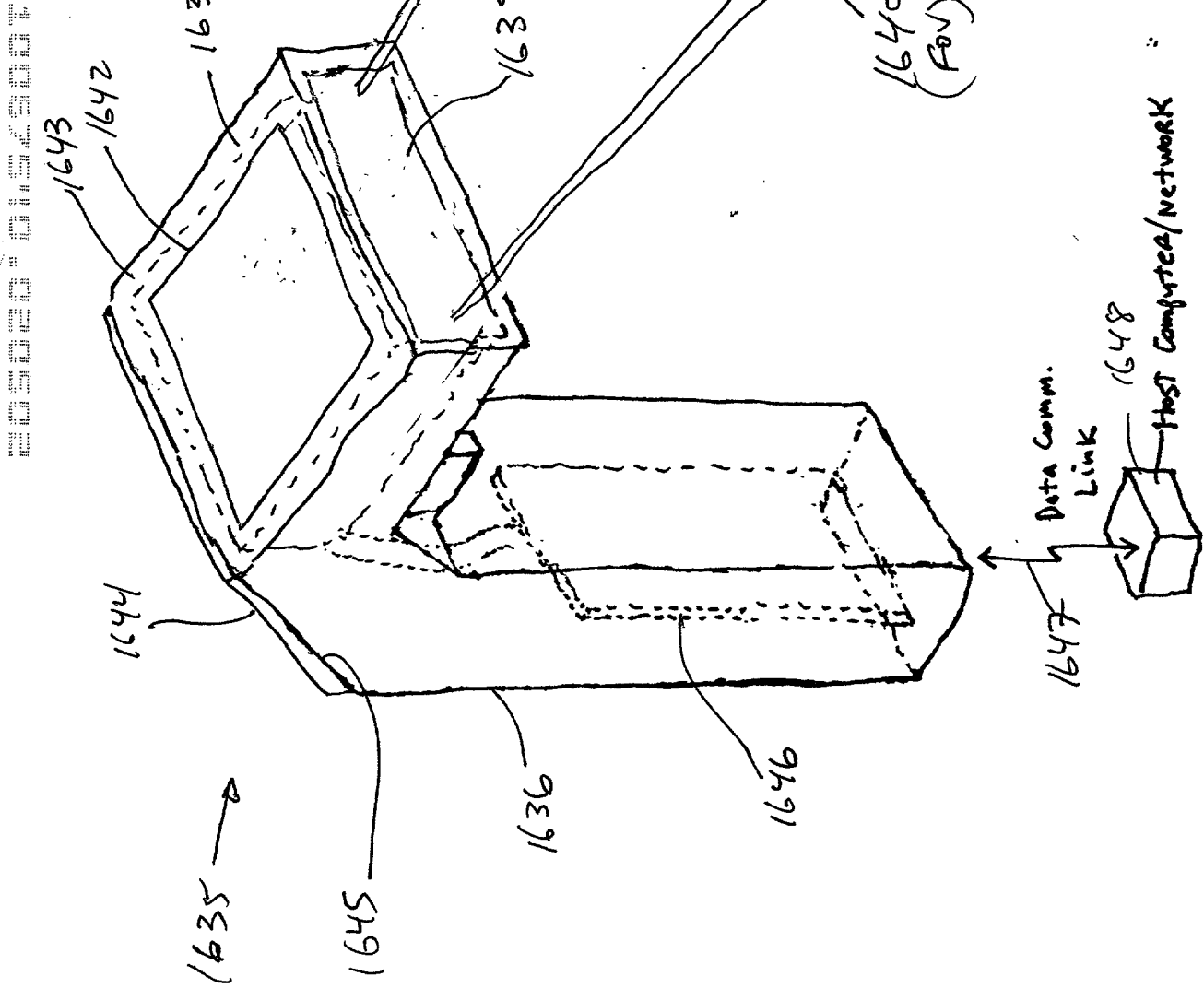


FIG. 45A

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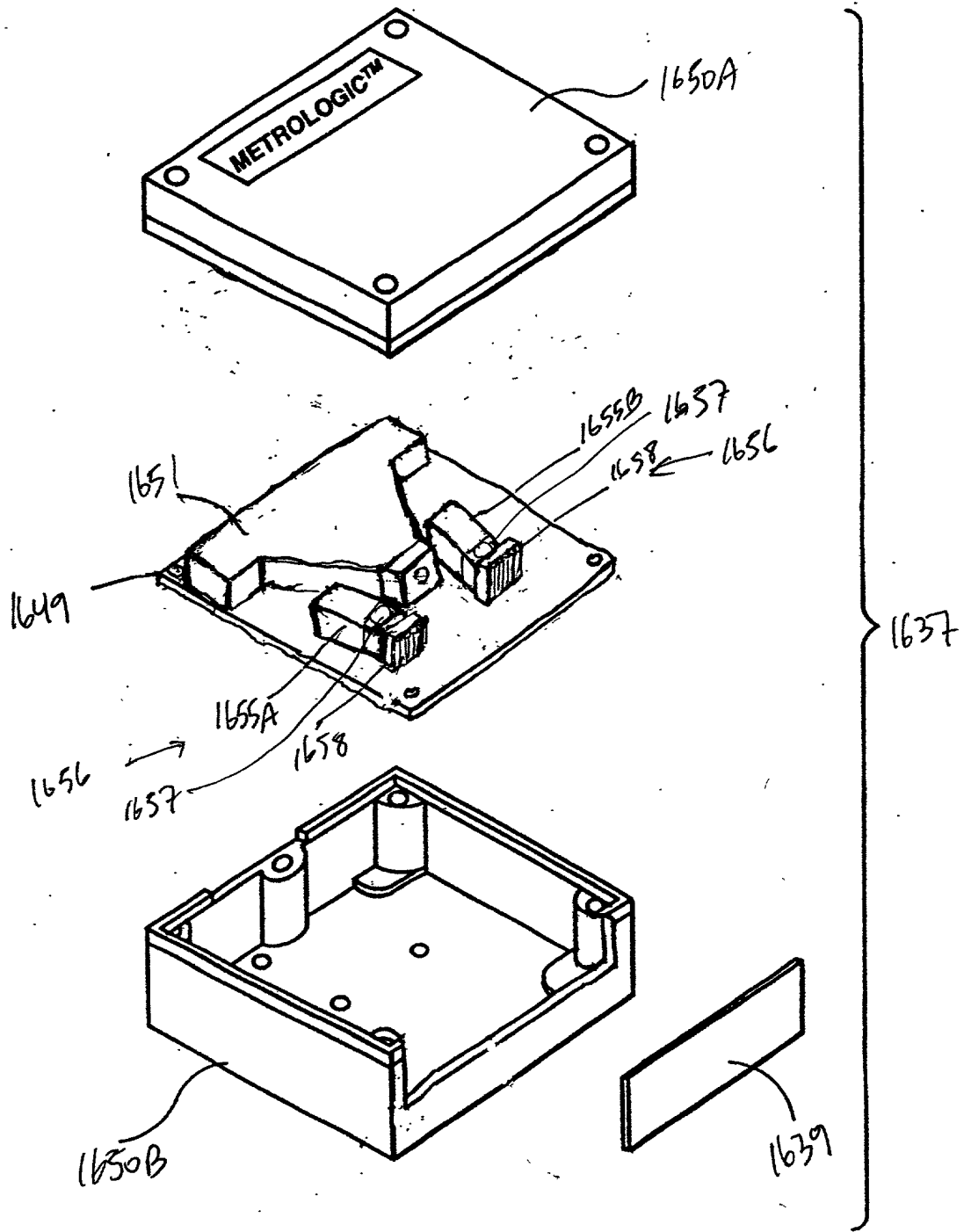


FIG. 45B

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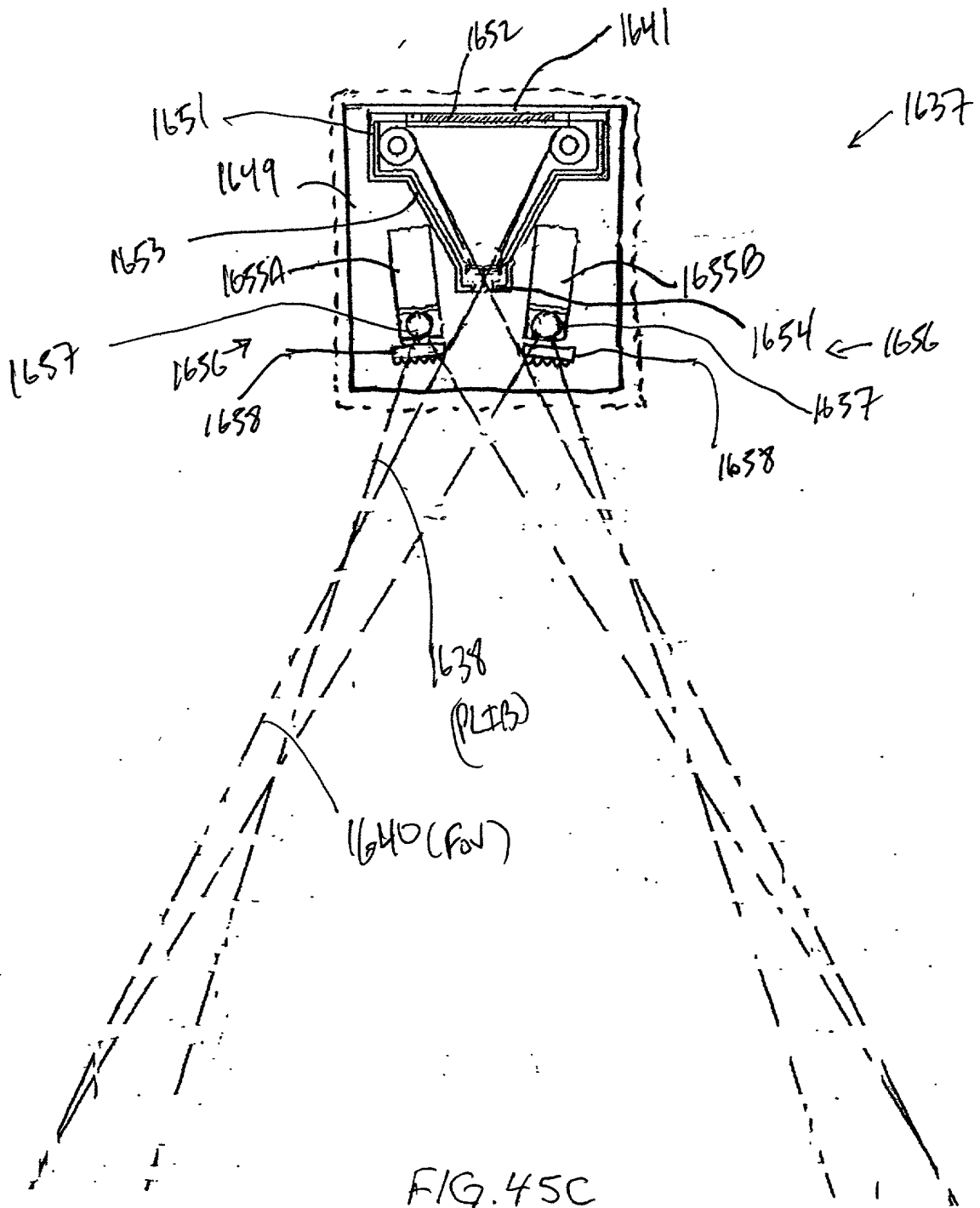


FIG. 45C

1-D
display
unit

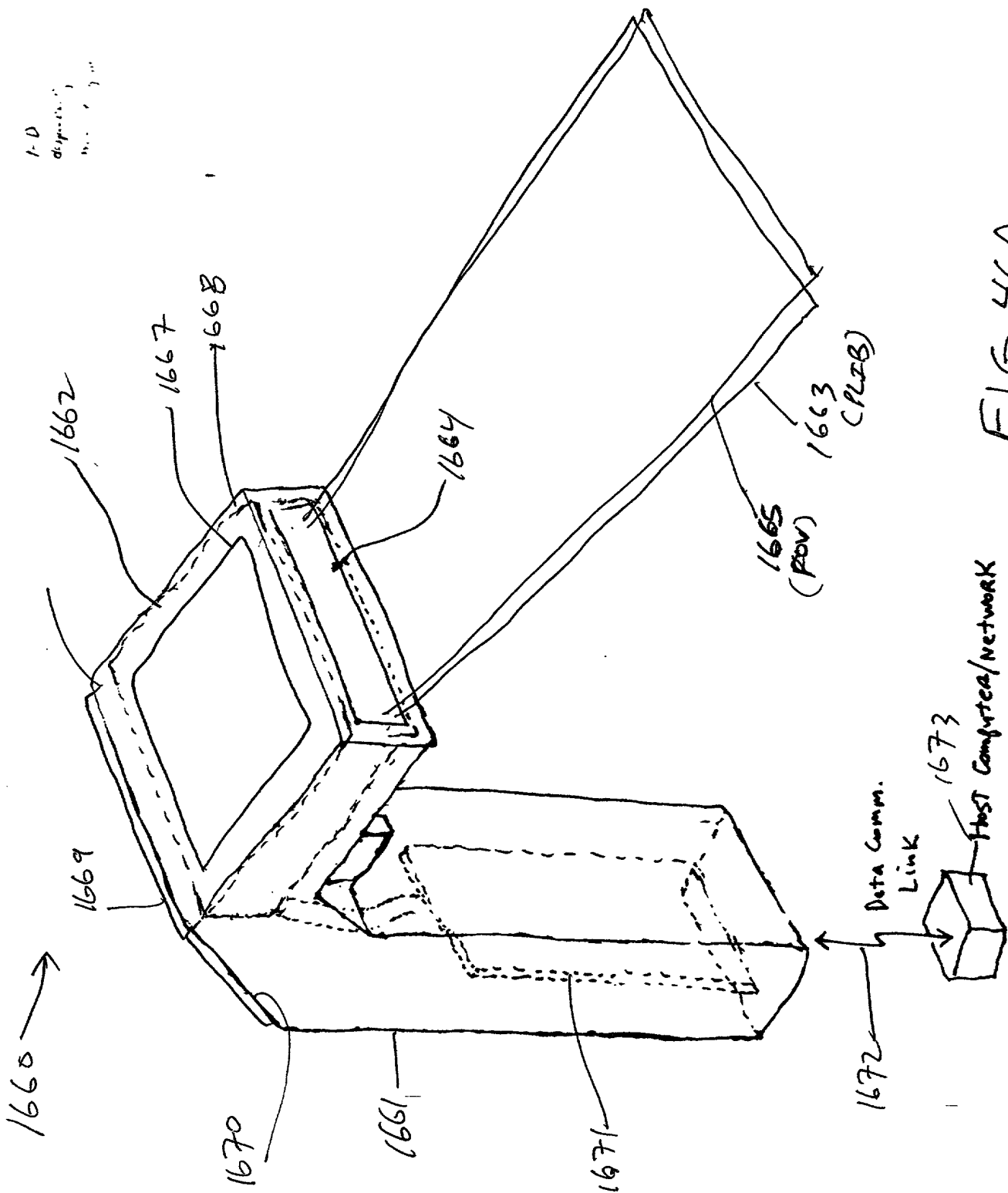


FIG. 46A

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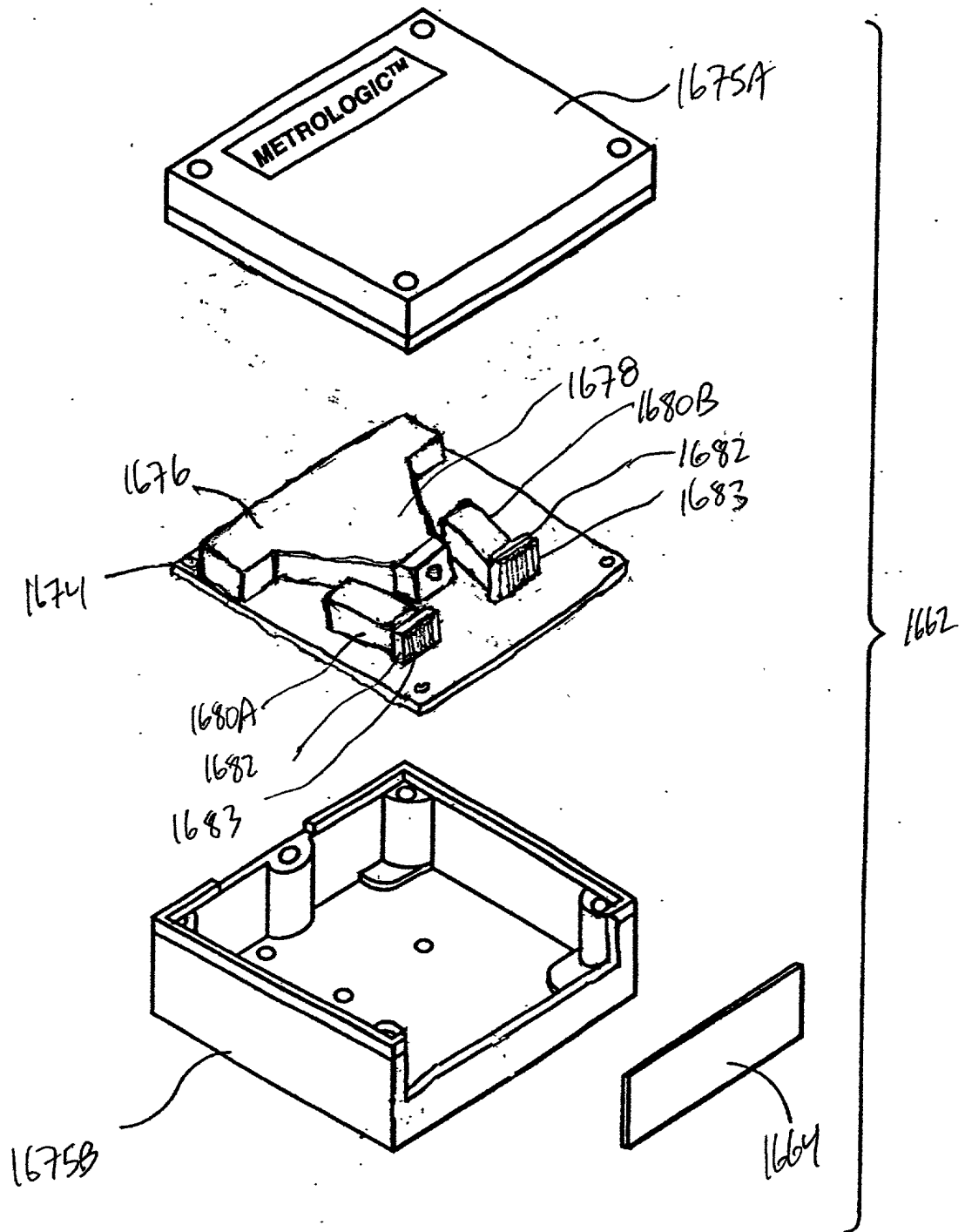
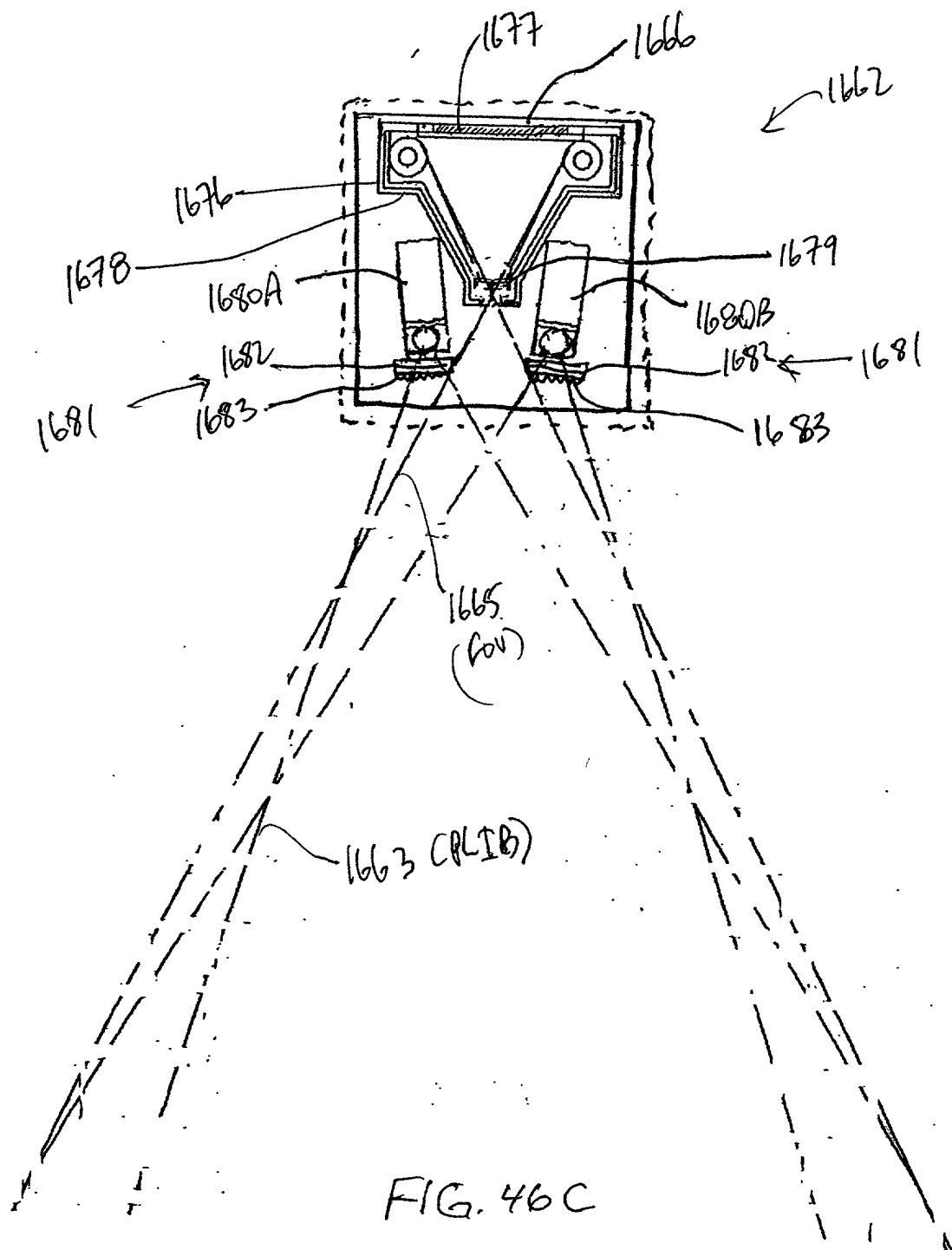


FIG. 46B

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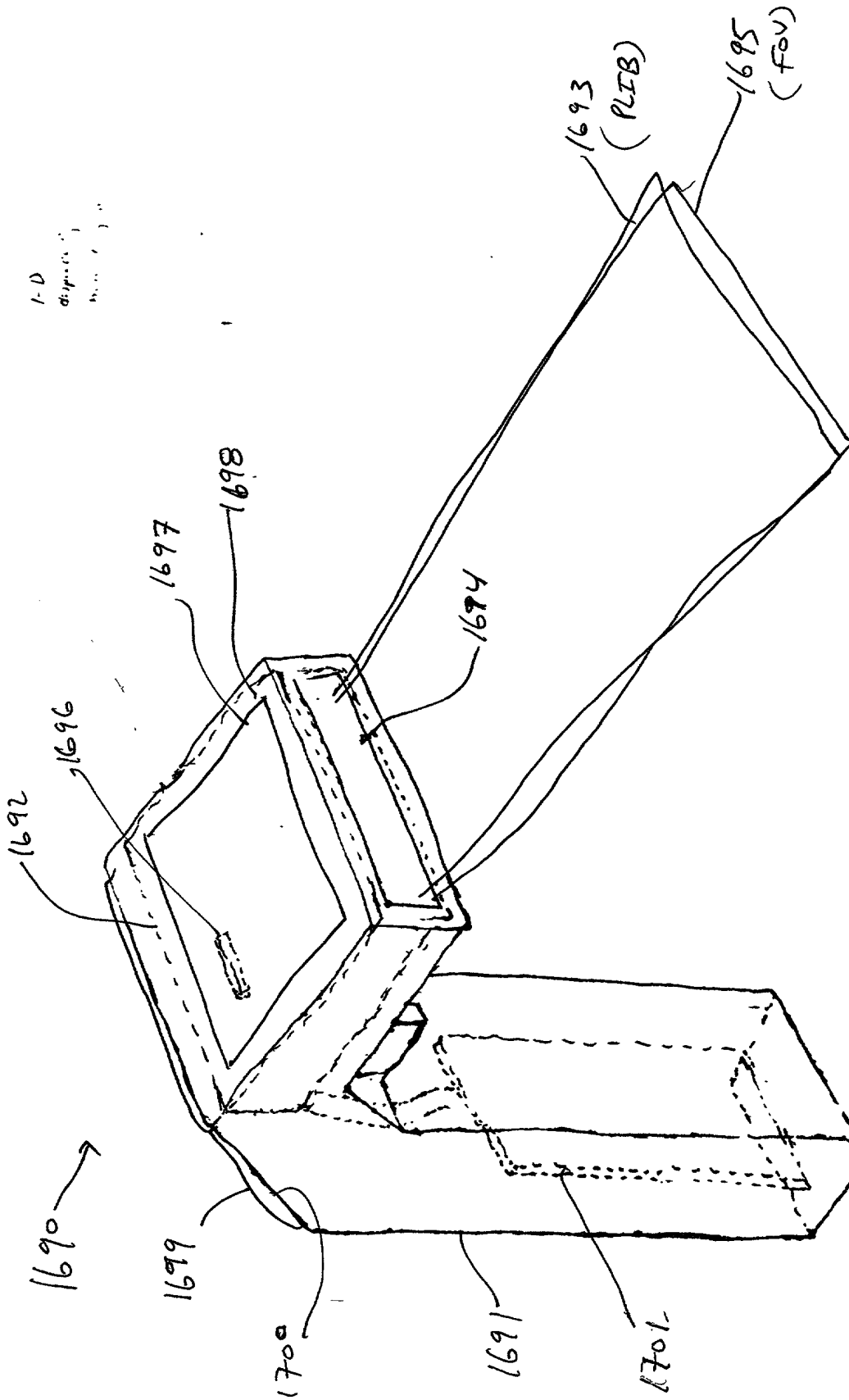


FIG. 47A

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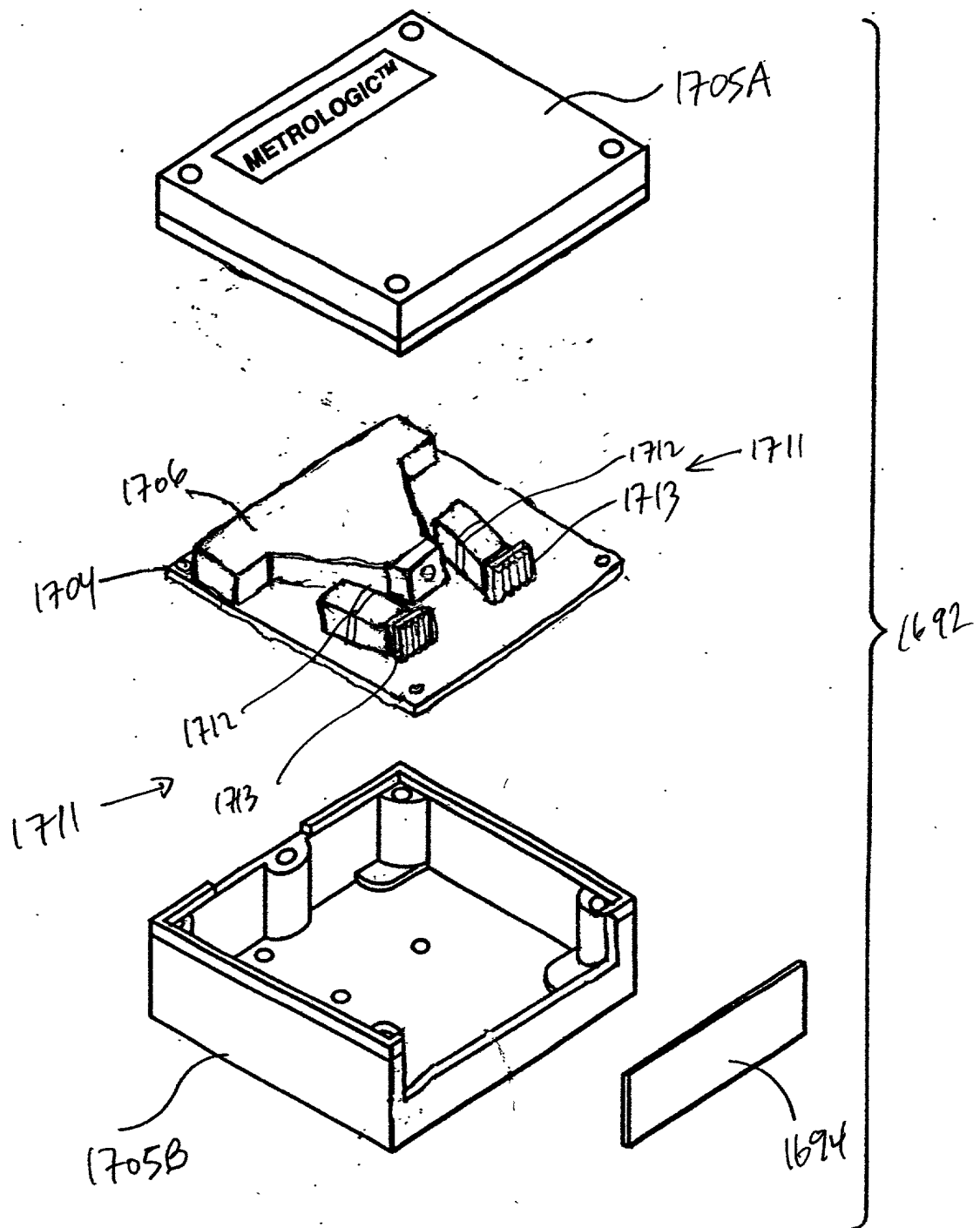


FIG. 47B

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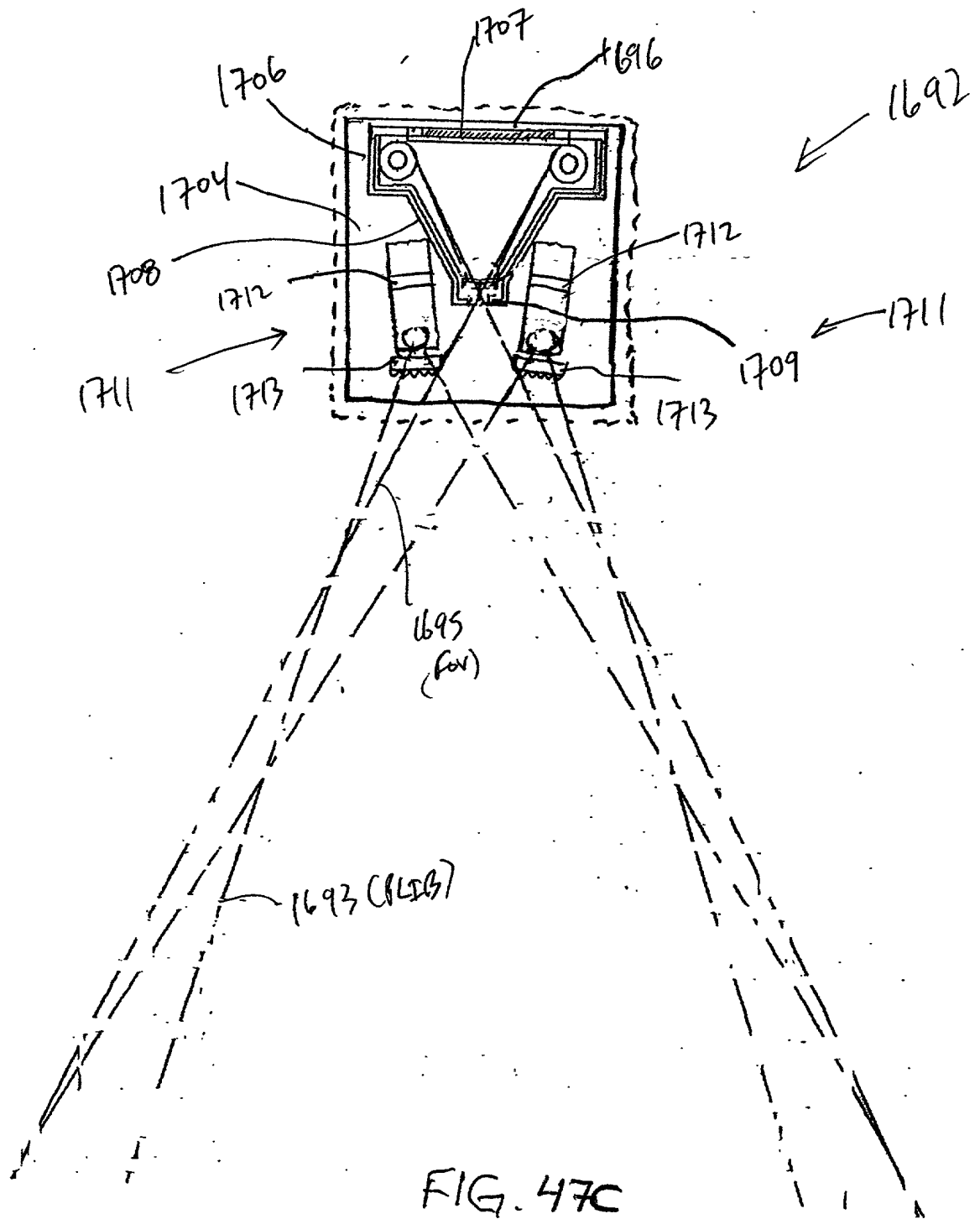


FIG. 47C

280/332

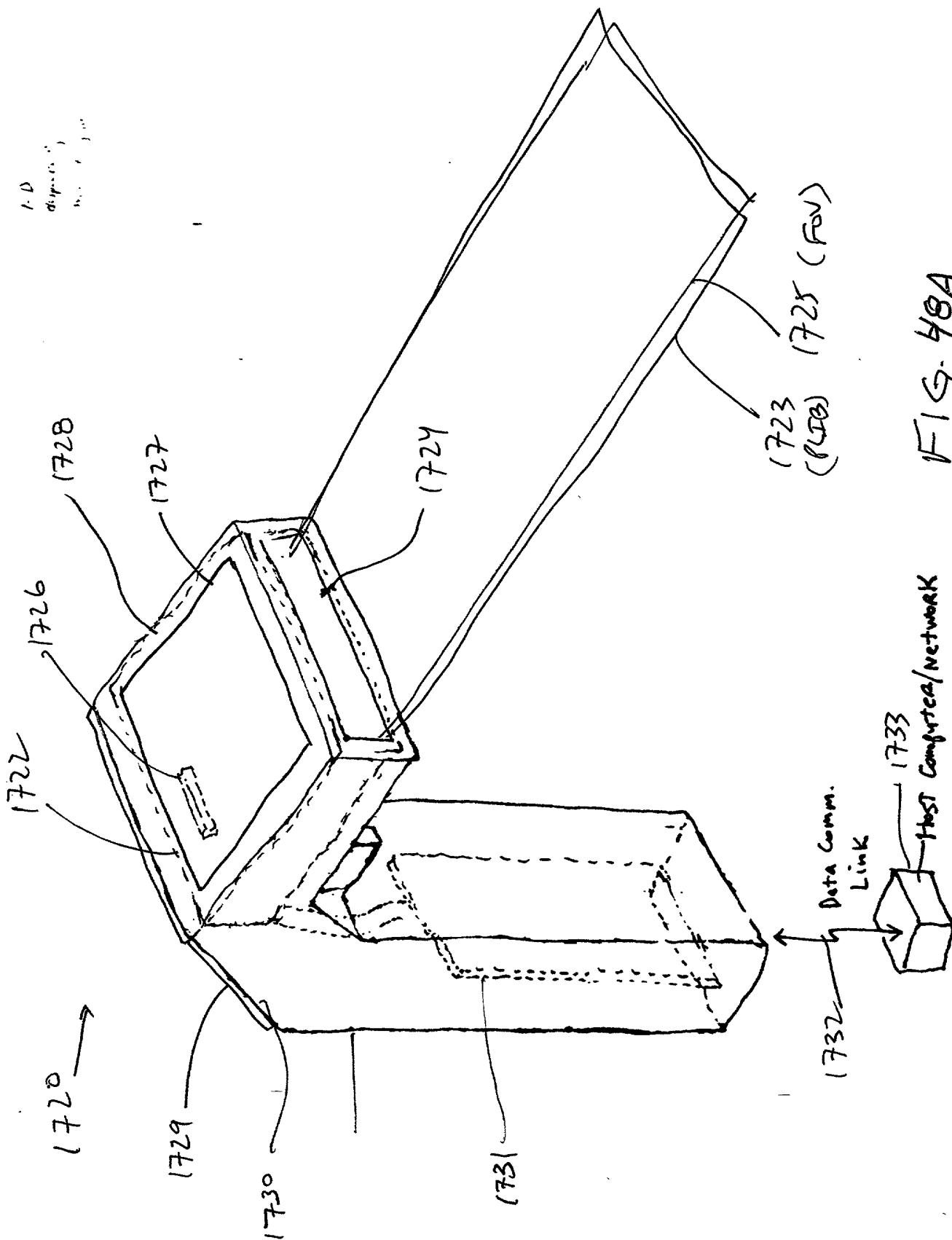


FIG. 48A

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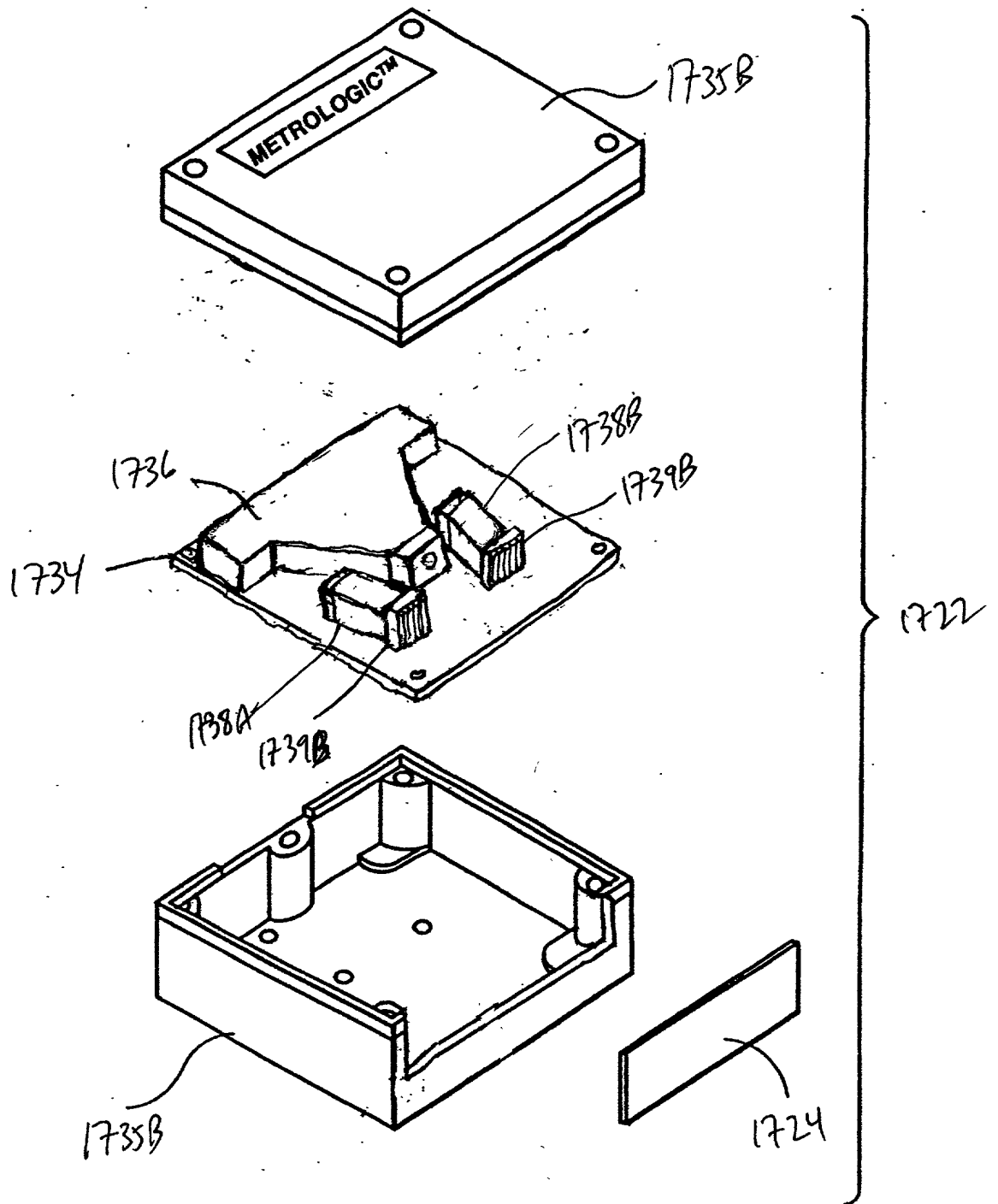
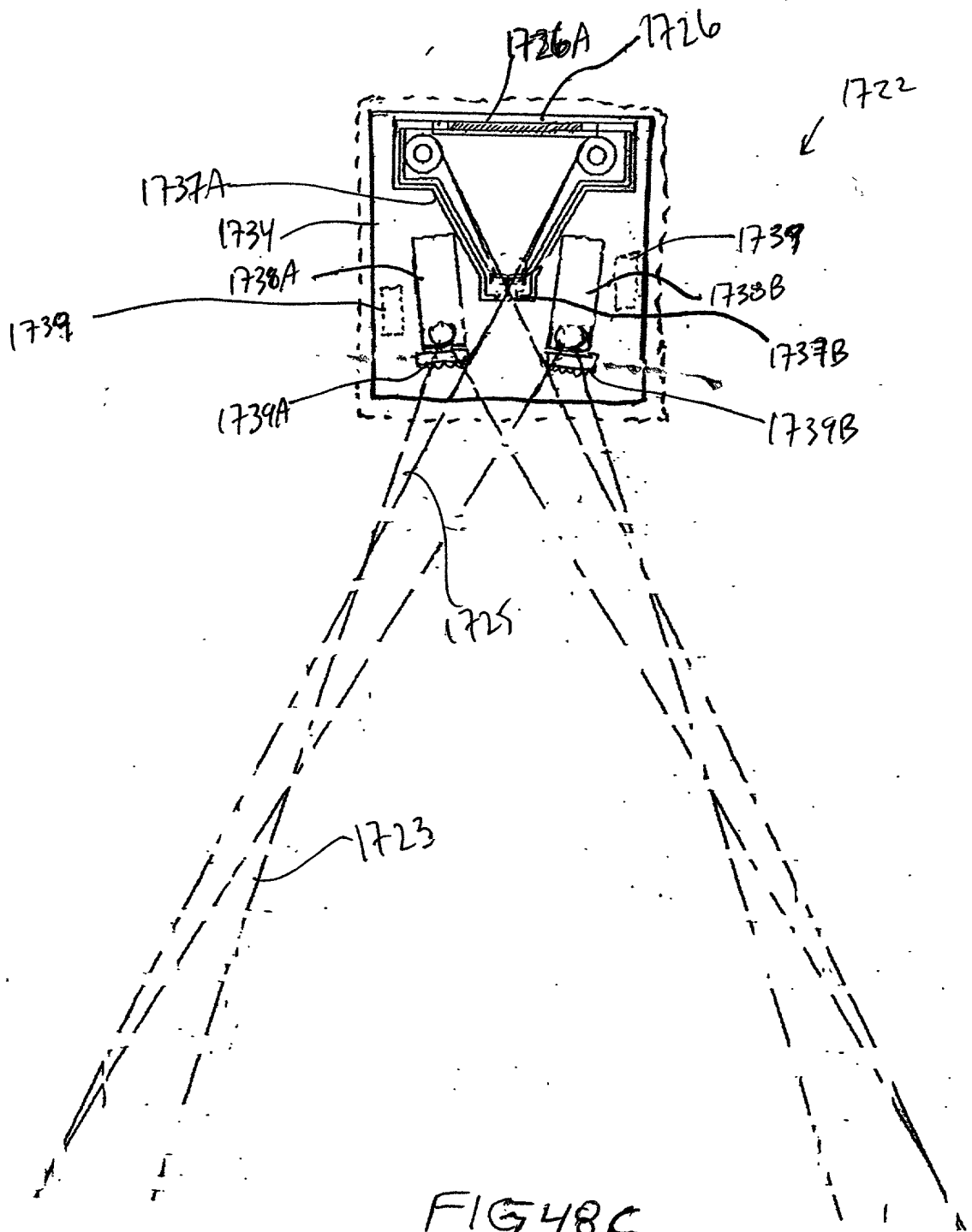


FIG. 48B

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1-D
display
unit

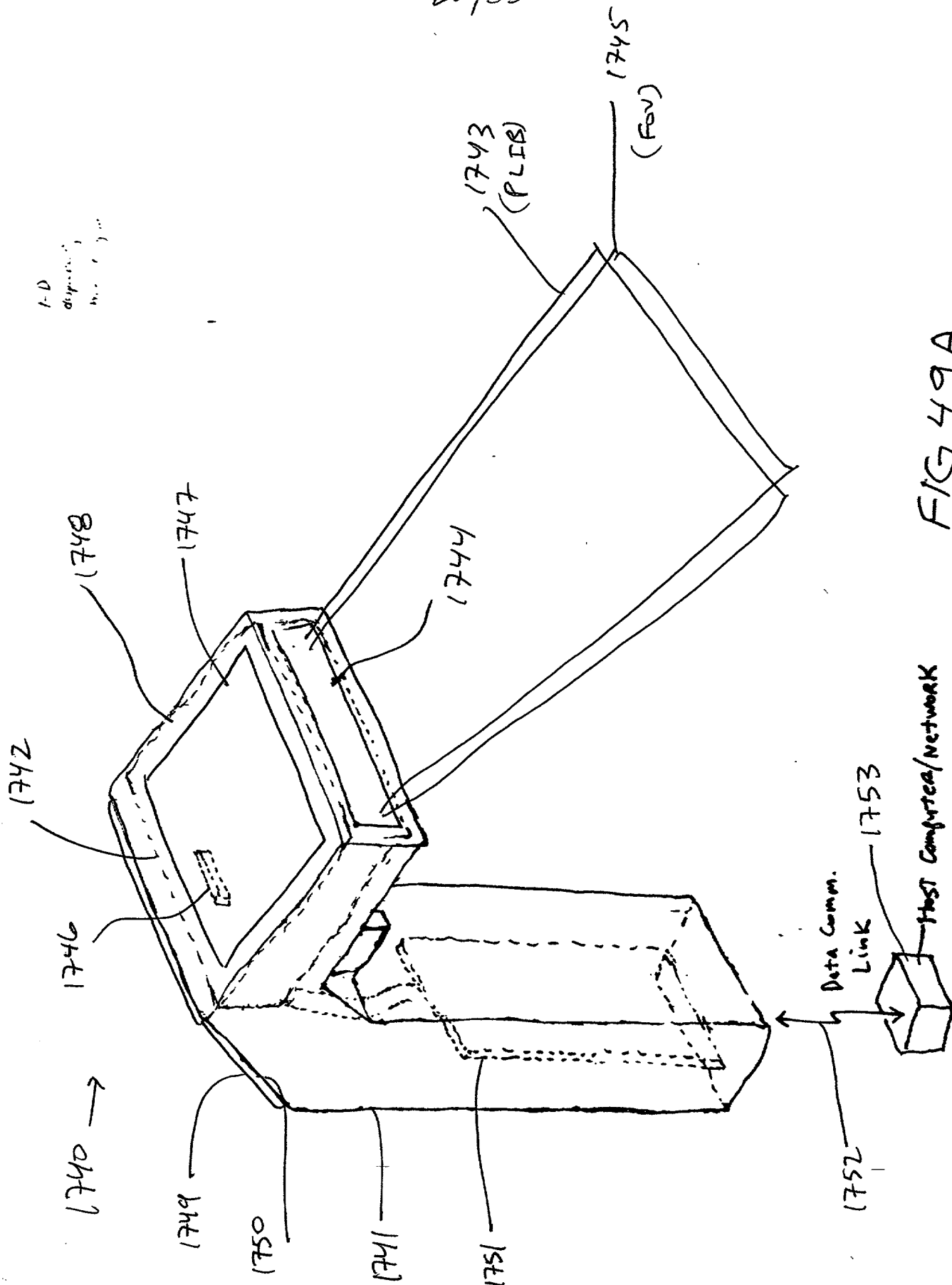


FIG. 49A

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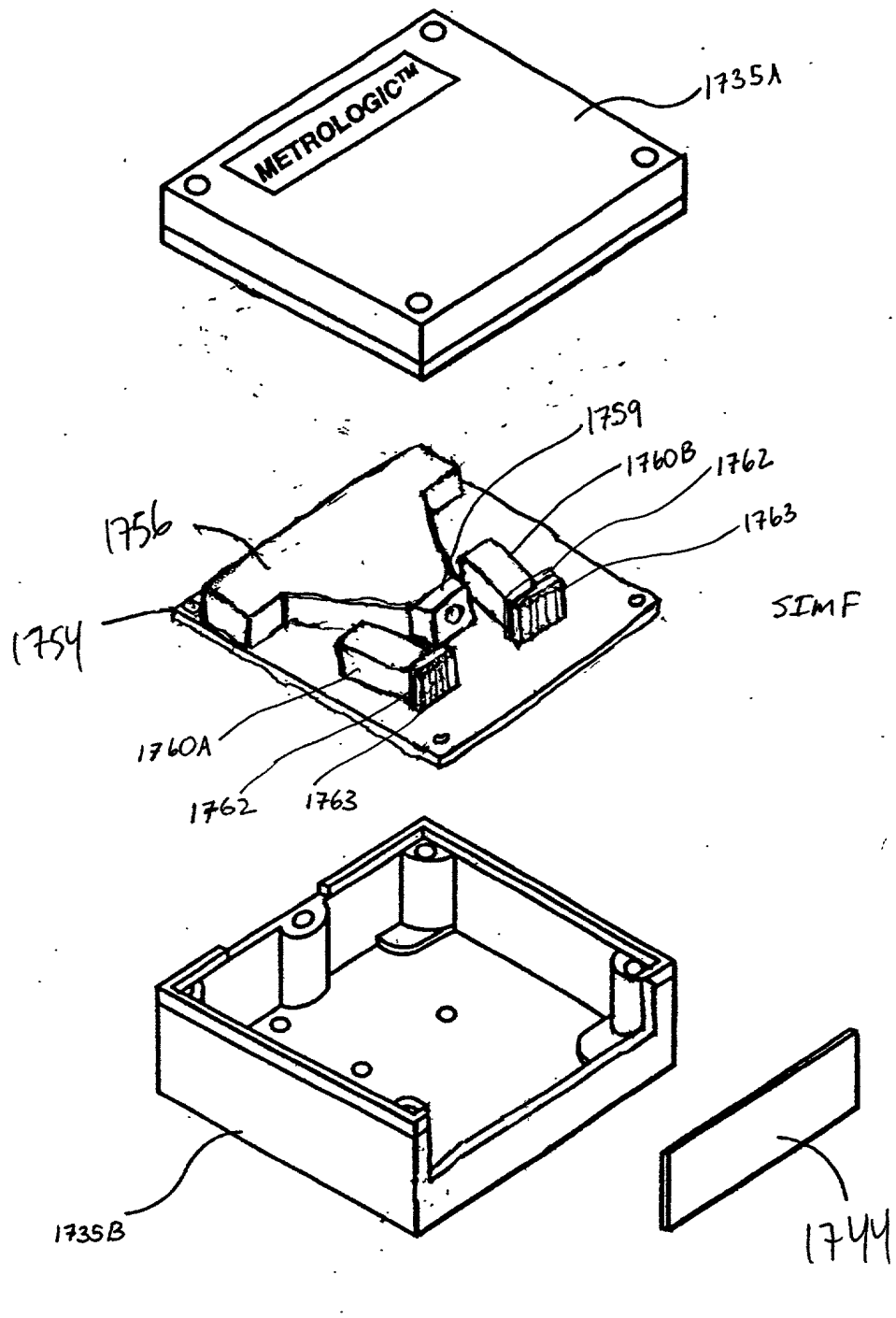
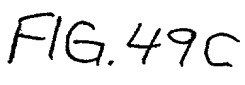
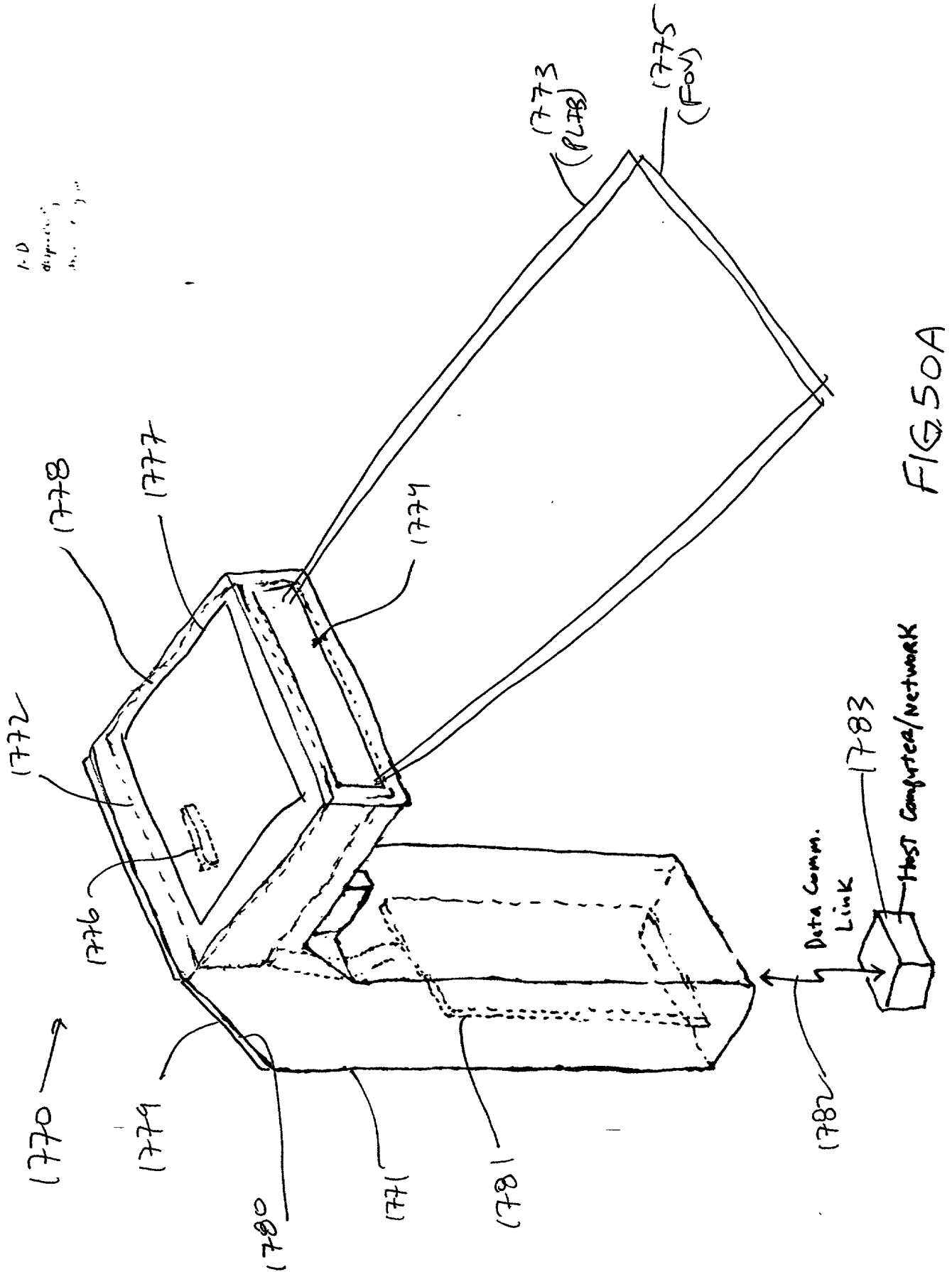


FIG. 49B

Figure 1 displays 100 small plots arranged in a 10x10 grid, showing the evolution of the probability distribution of the number of infected individuals over time. The rows represent different parameter sets (a, b, c, d, e, f, g, h, i, j) and the columns represent different time points (t = 0, 1, 2, 3, 4, 5, 6, 7, 8, 9). Each plot shows a histogram of the number of infected individuals (x-axis) against probability (y-axis). The distributions generally shift to the right (higher number of infected) as time increases.



1-D
display
...



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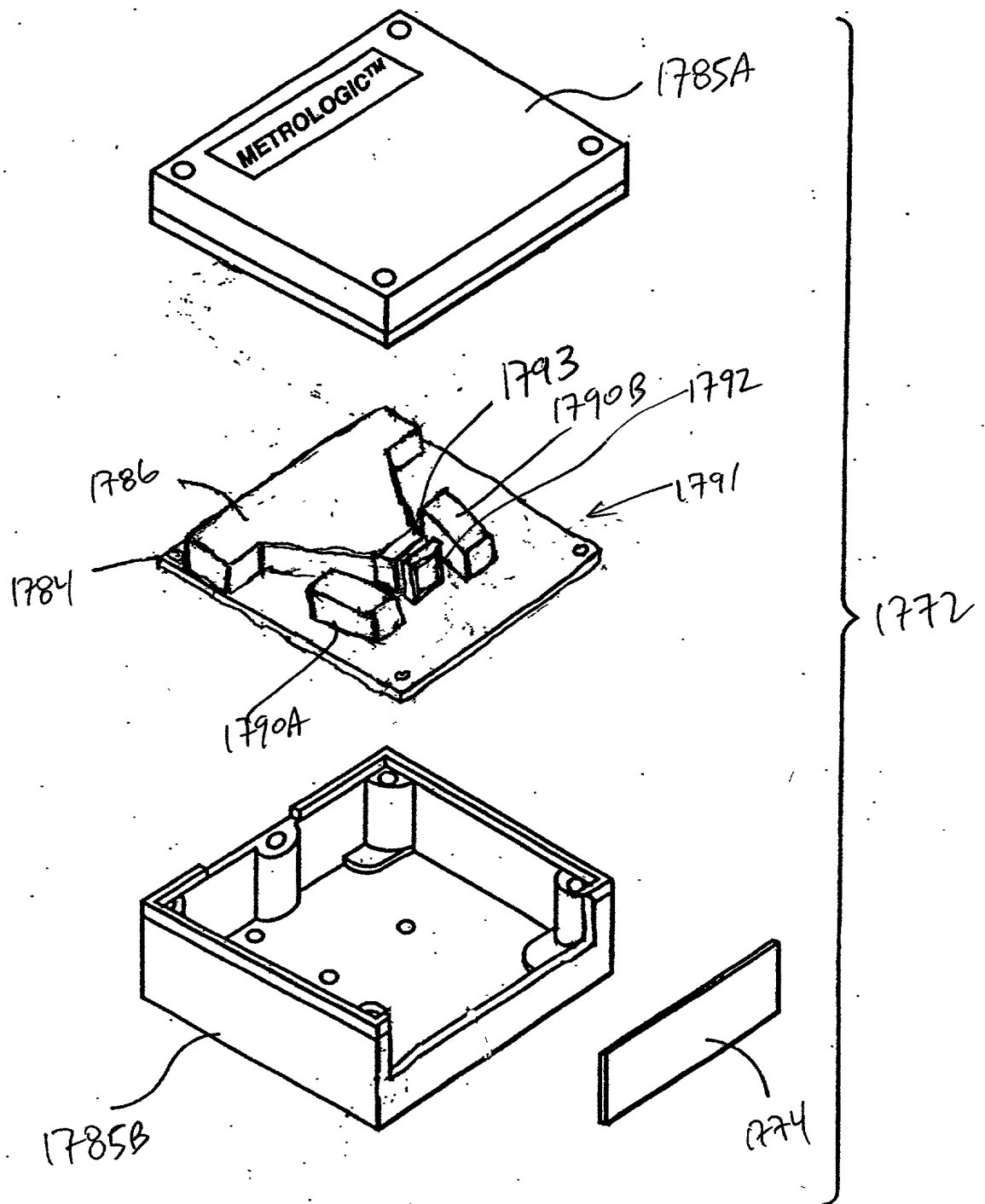
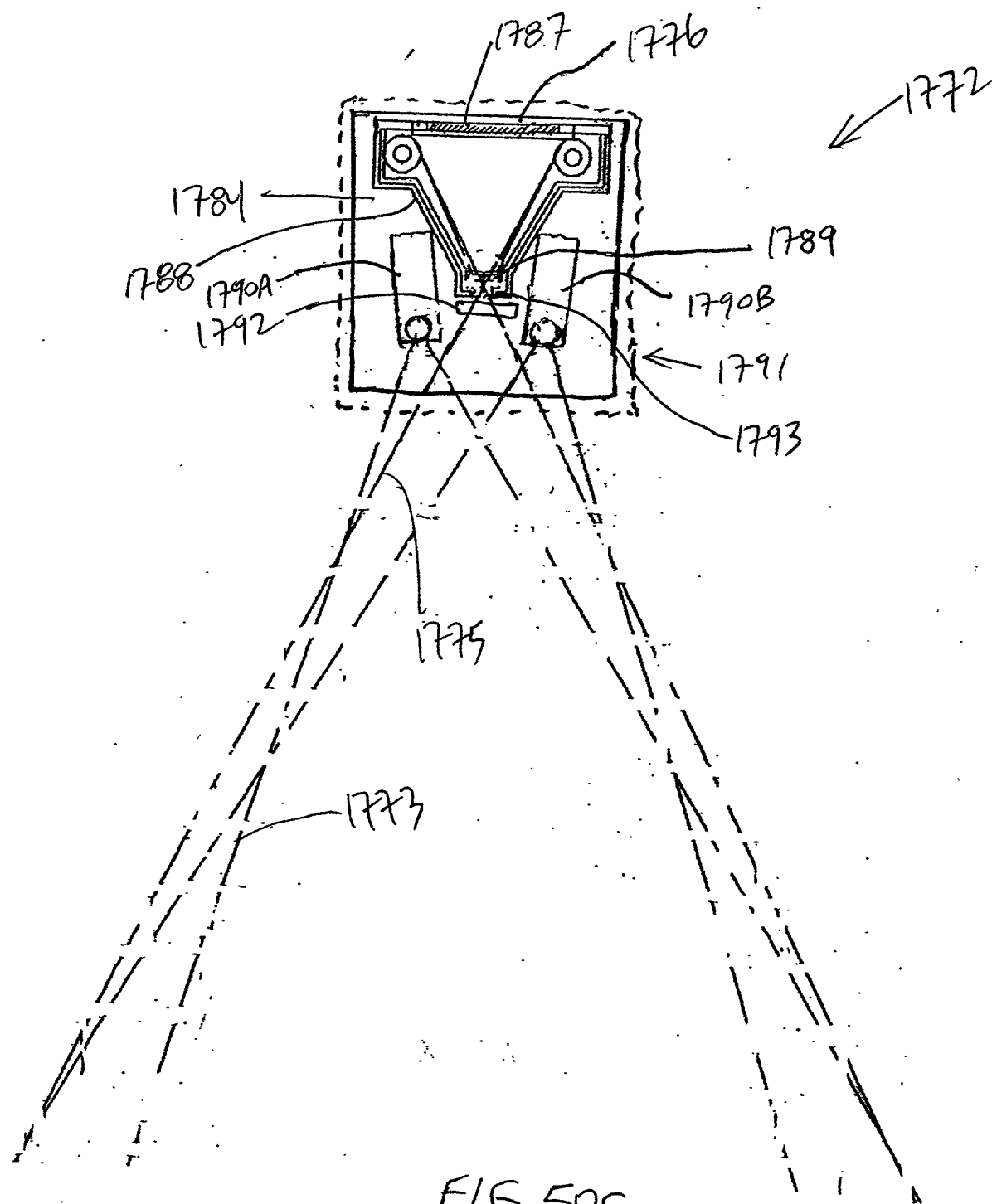
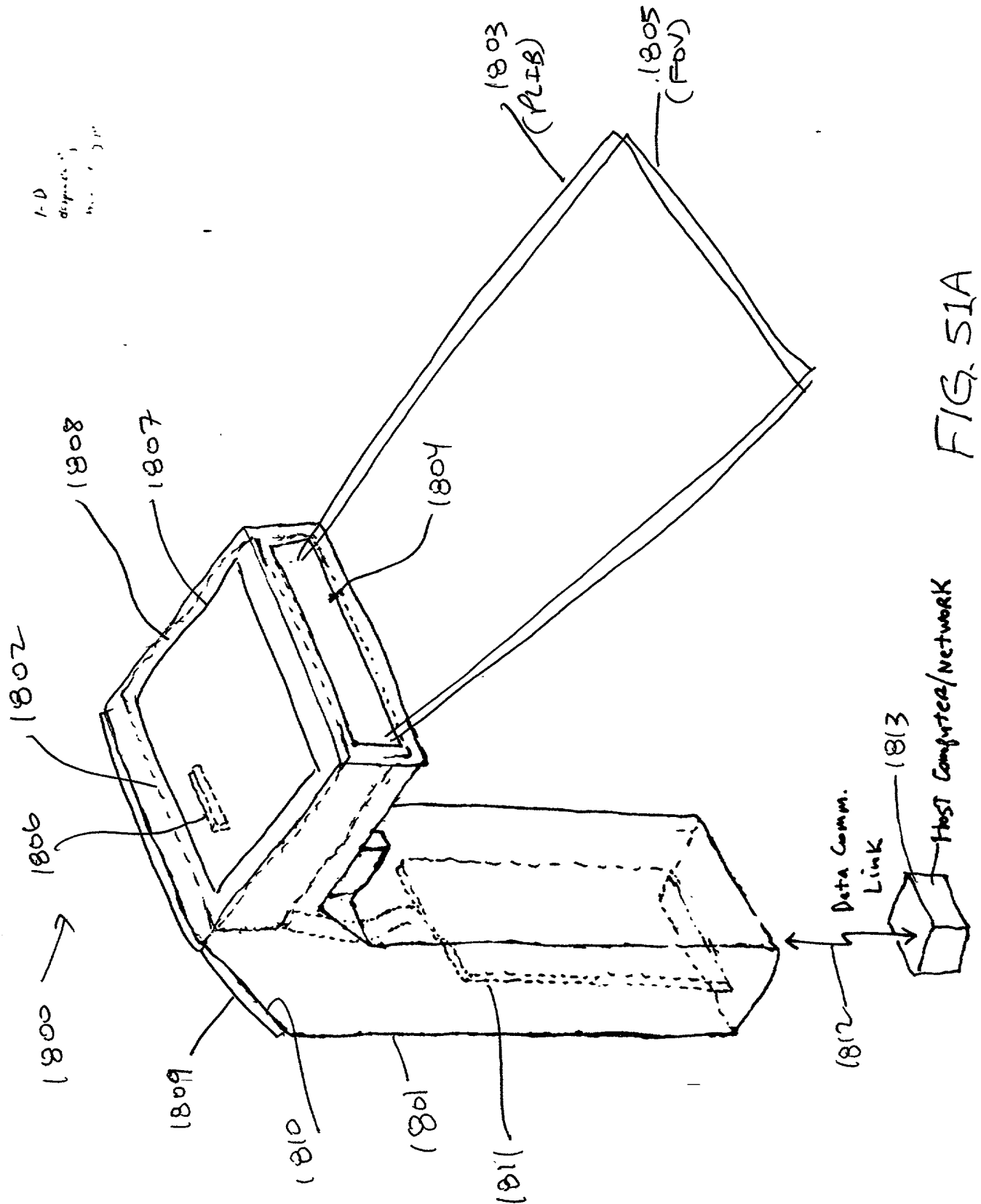


FIG. 50B

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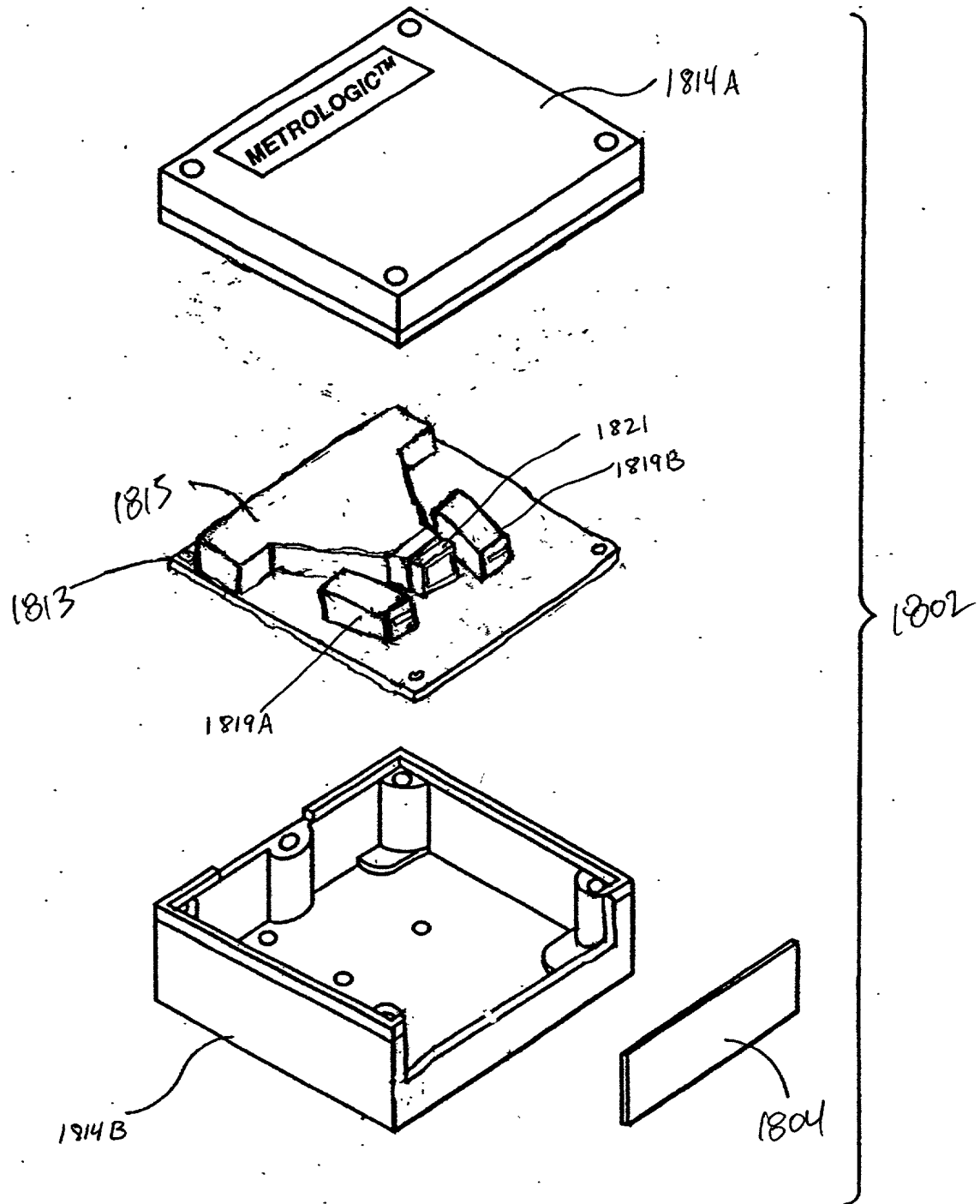


FIG. 51B

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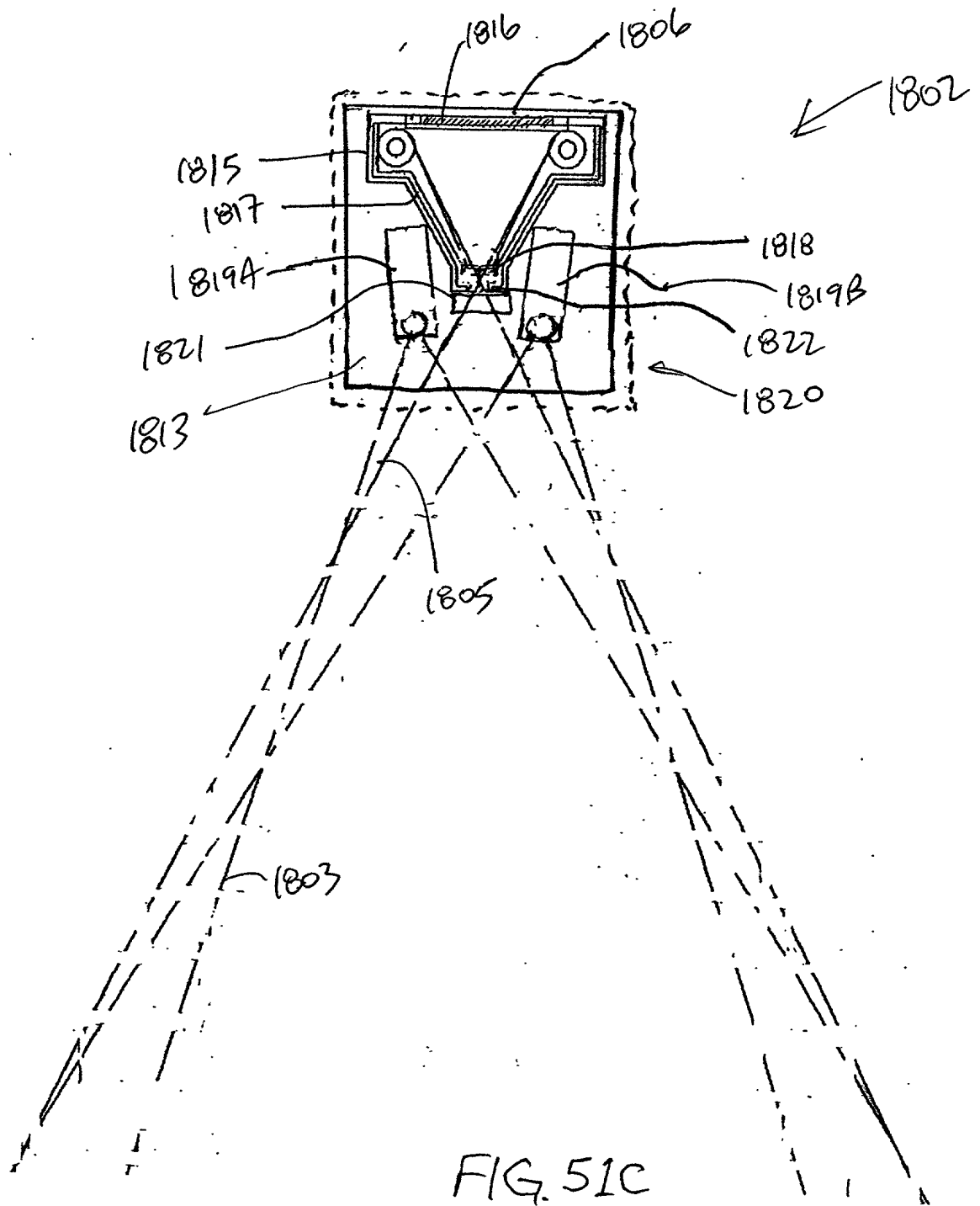


FIG. 51C

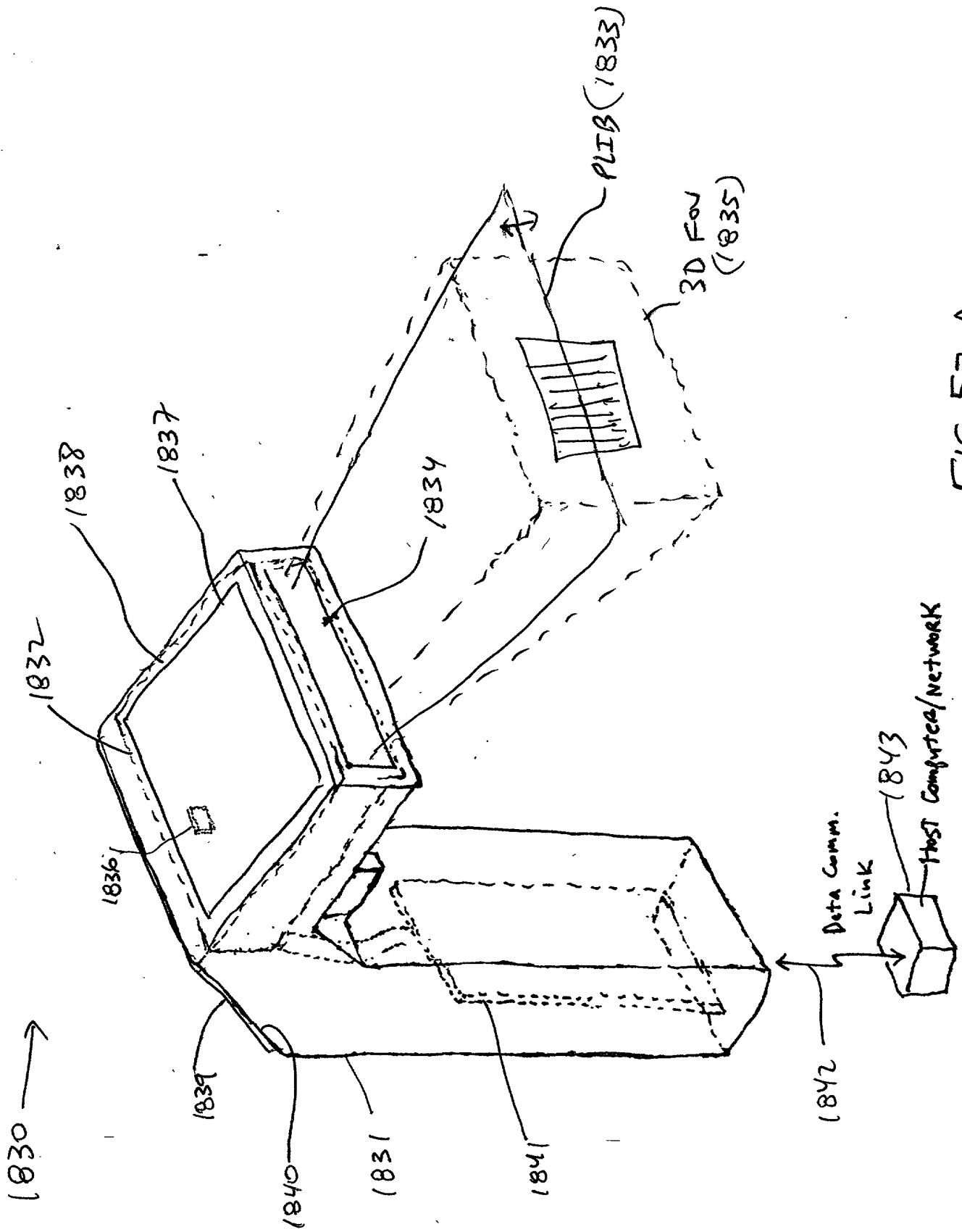


FIG. 52A

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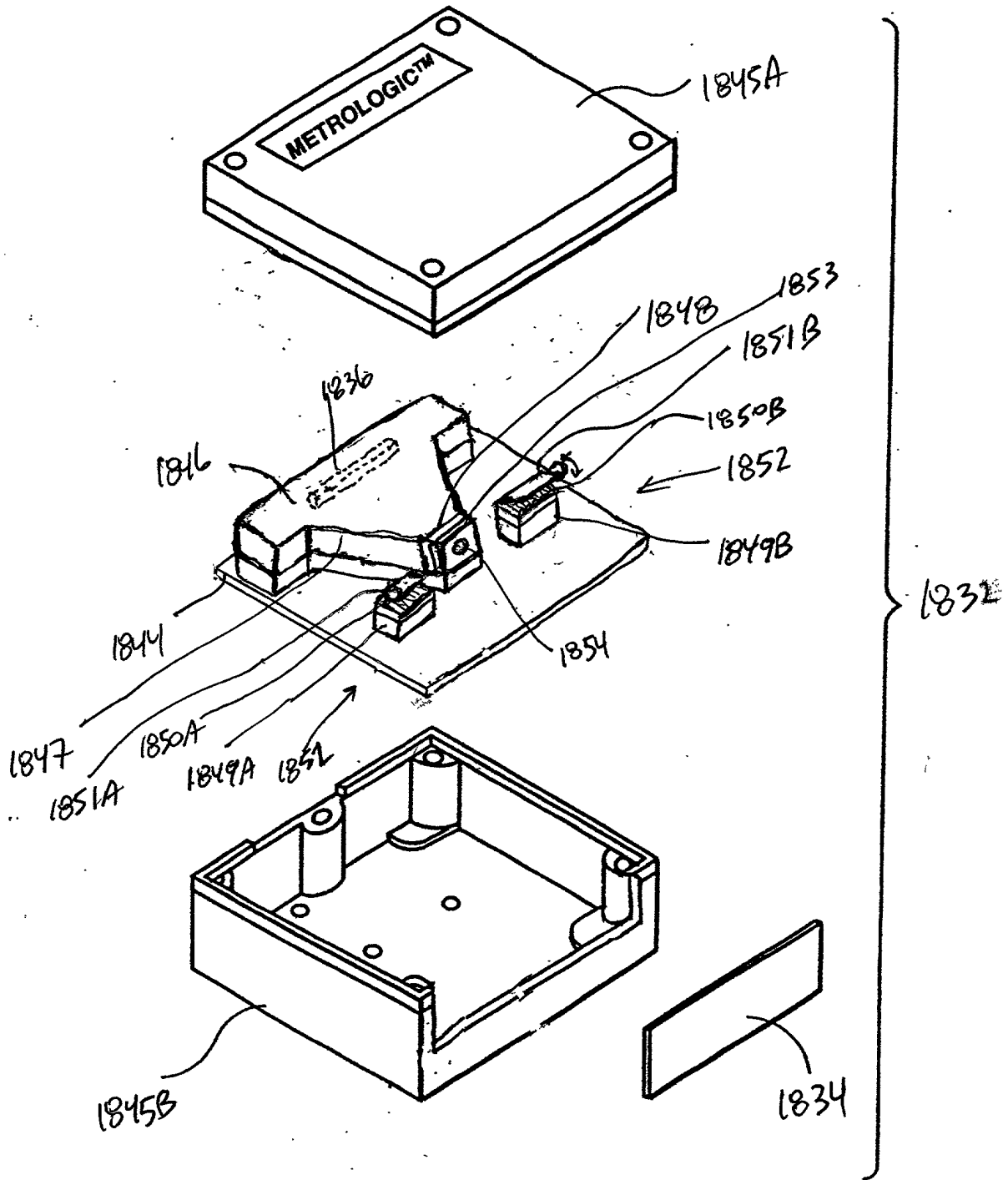
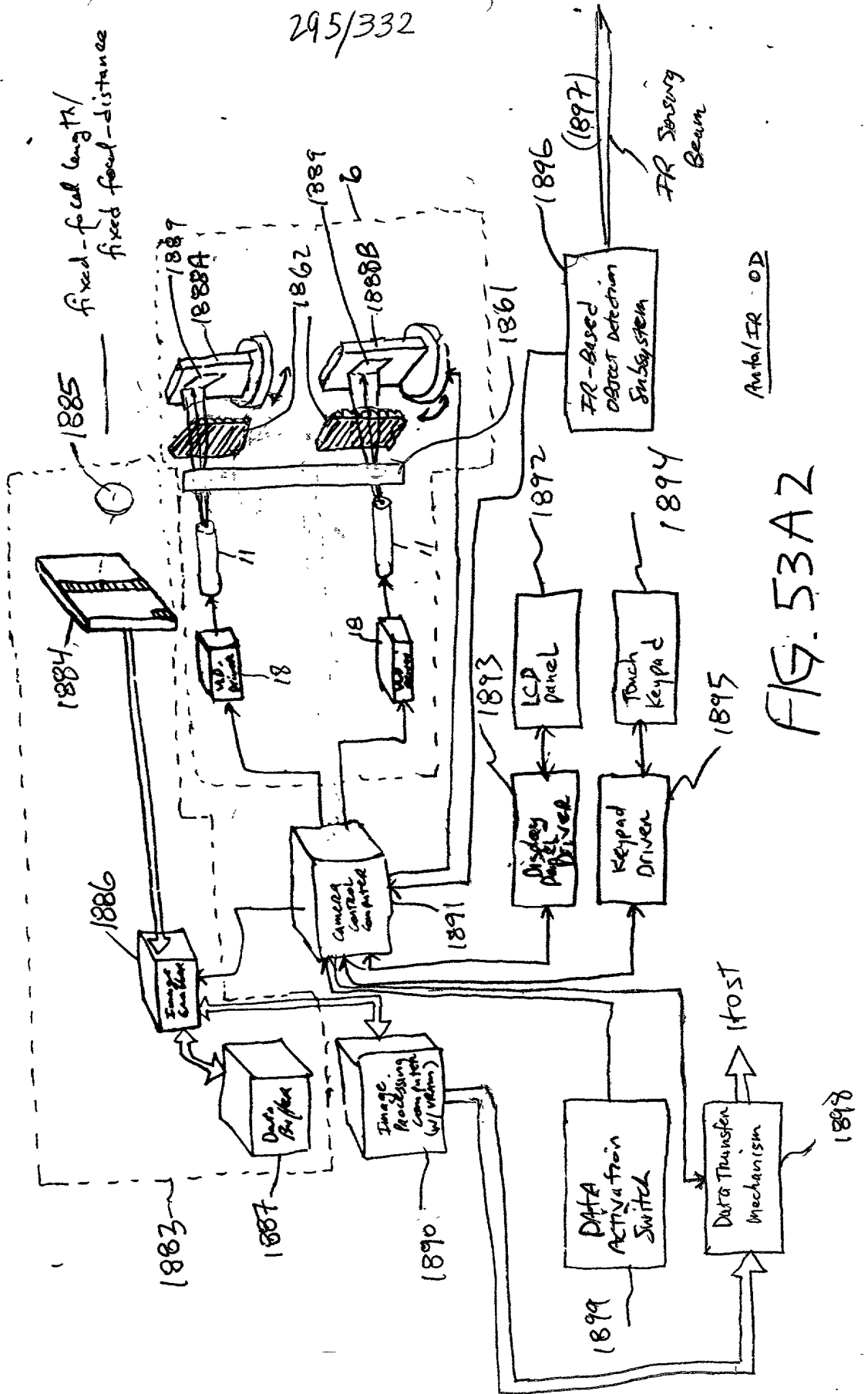


FIG. 52B

Fig. 1I 3A-3B

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1880



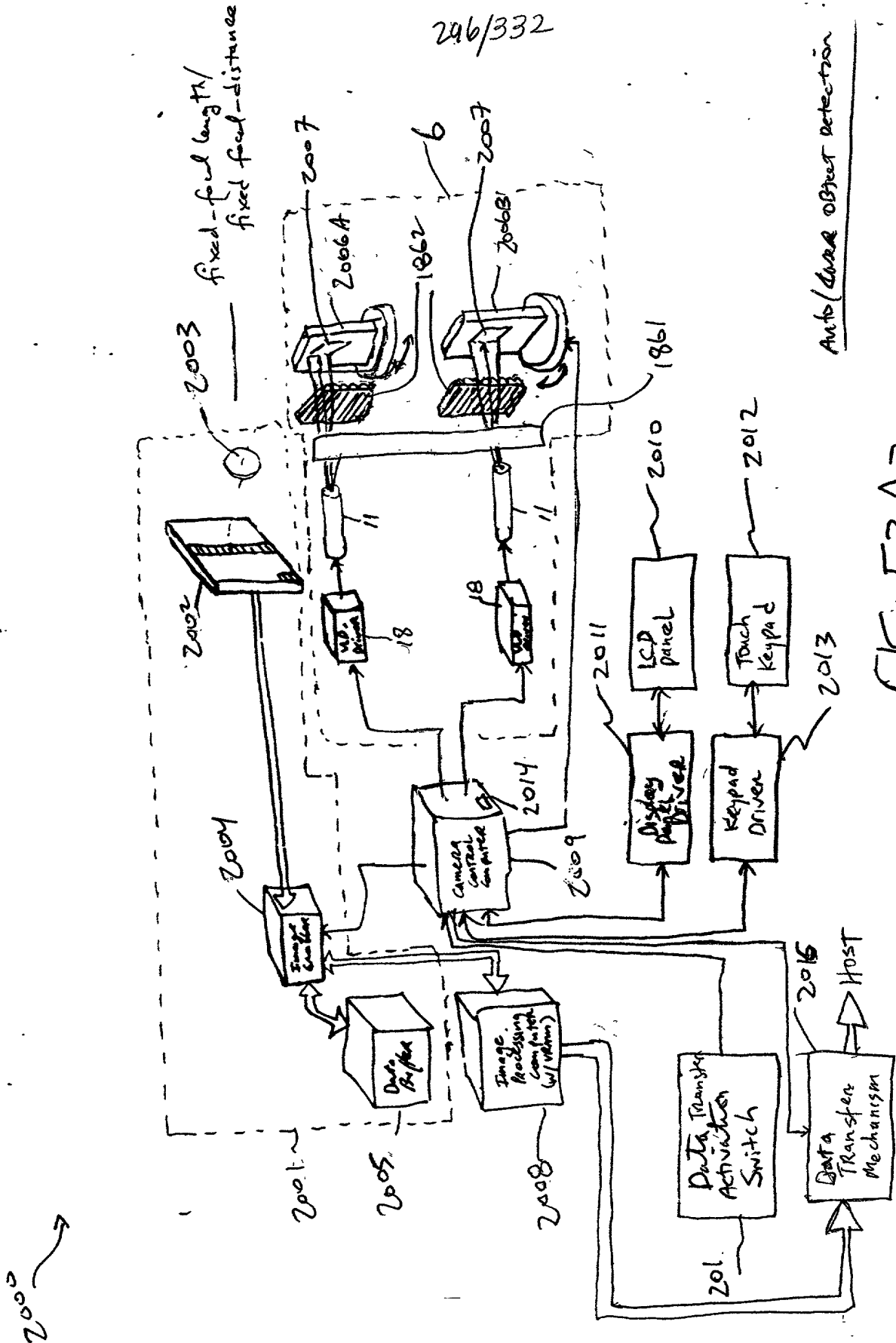
Auto/IR-OD

FIG. 53A2

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Auto/Load Object detection

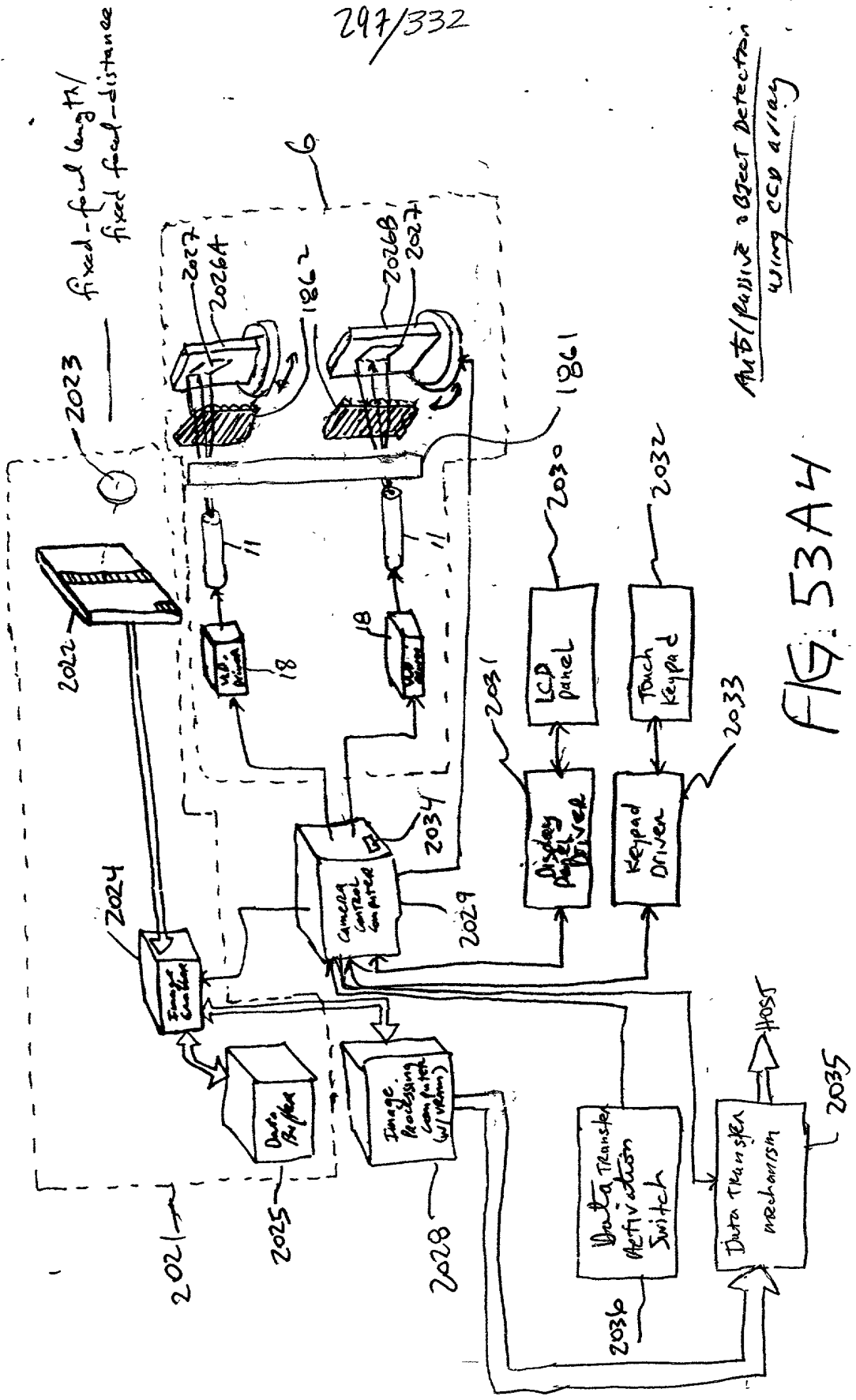
FIG. 53A3



2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035

2020 →

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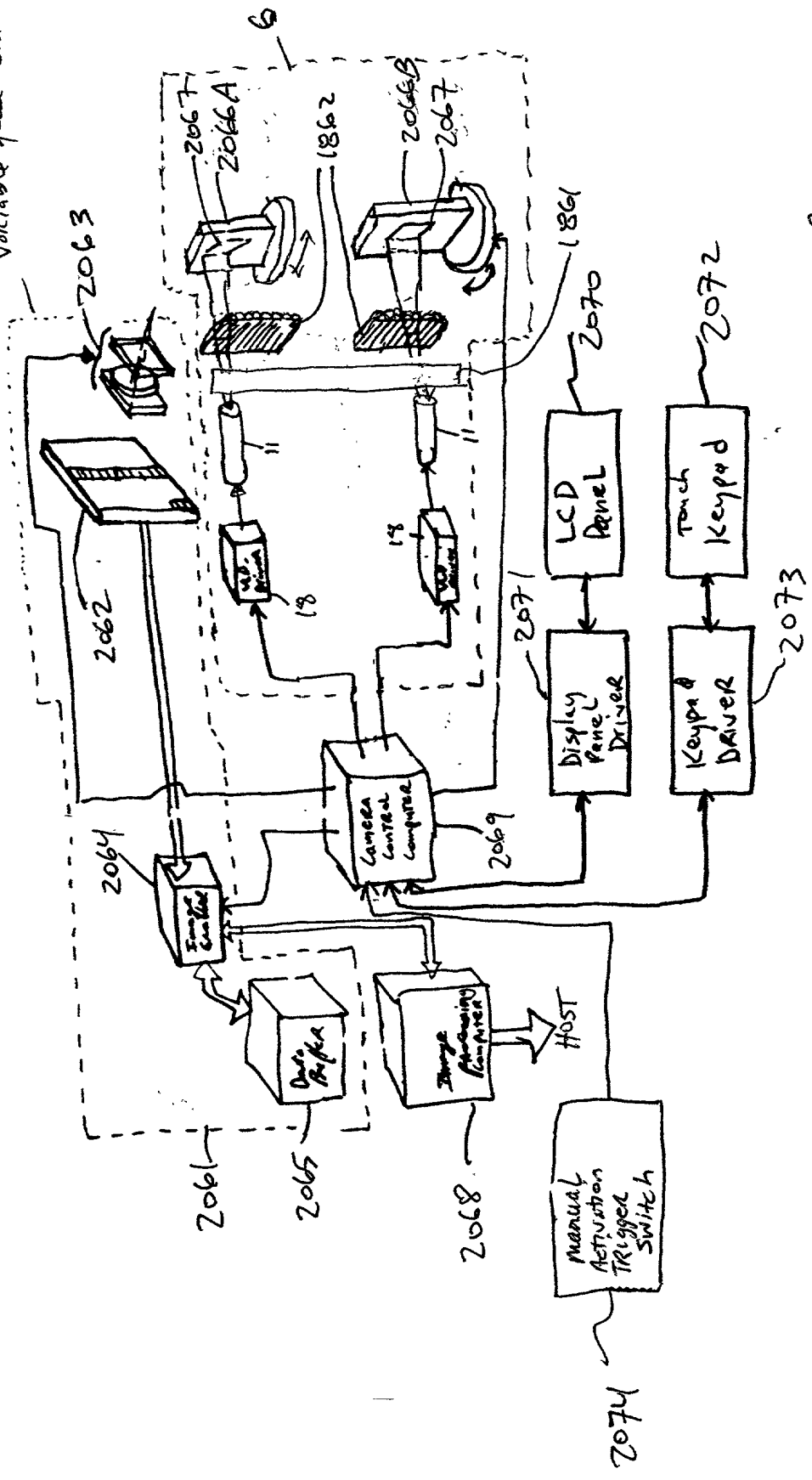
Auto/Passive Object Detection
using CCD array

FIG. 53A4

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2060 →

fixed focal length/
variable focal distance



Manual

FIG. 53B1

2080

fixed focal length/
variable focal distance

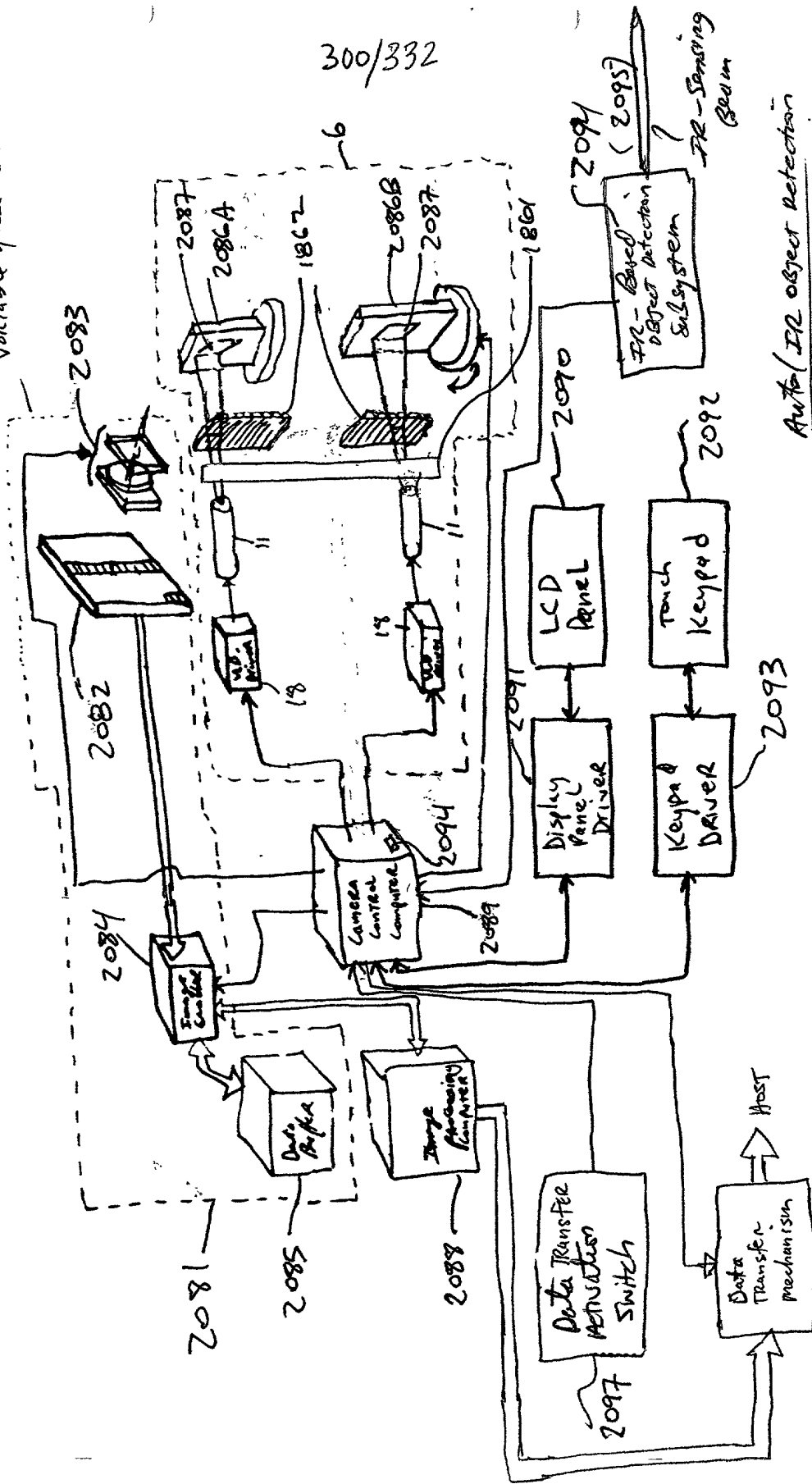
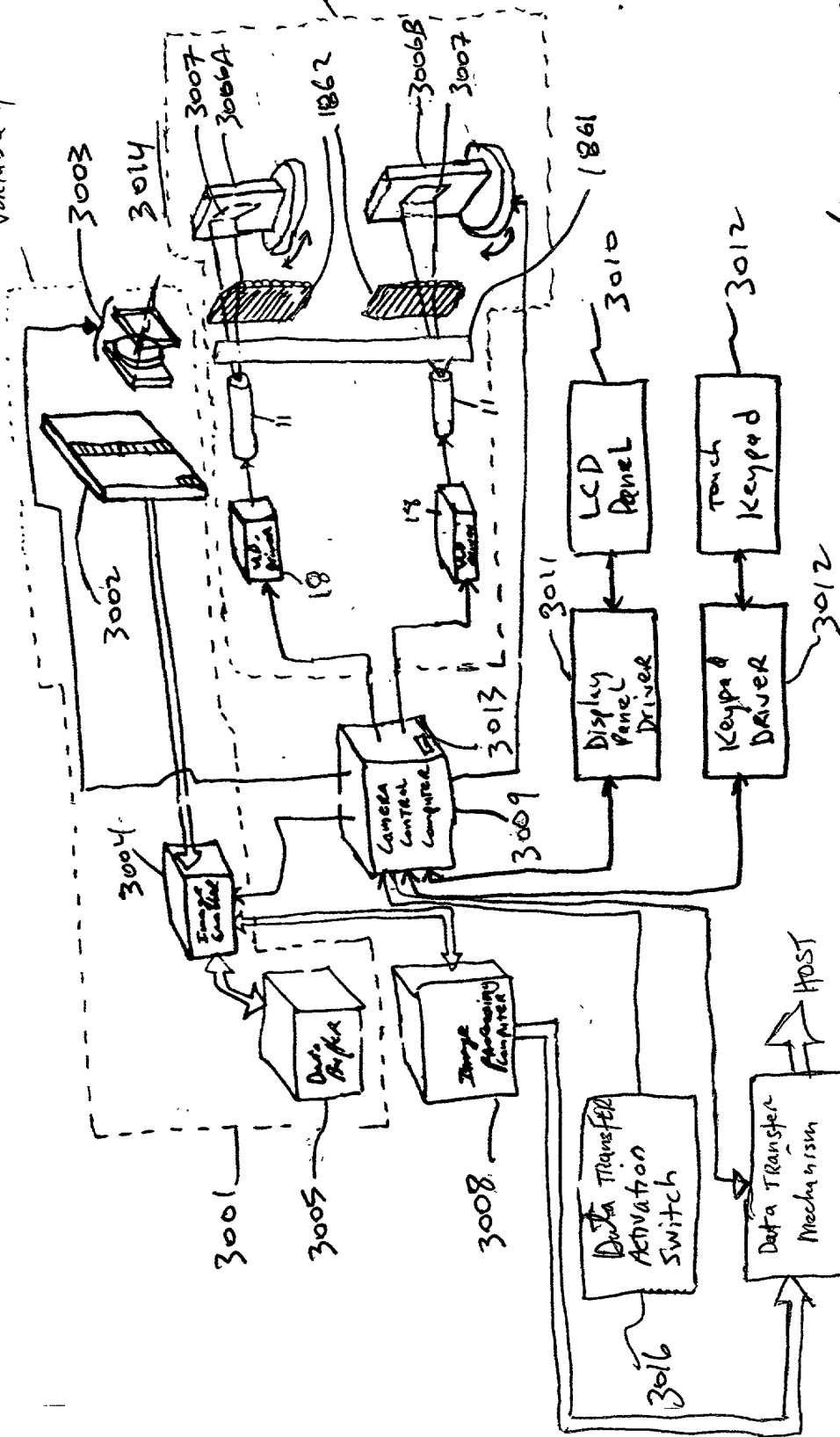


FIG. 53B2

2096

3000

fixed focal length/
variable focal distance



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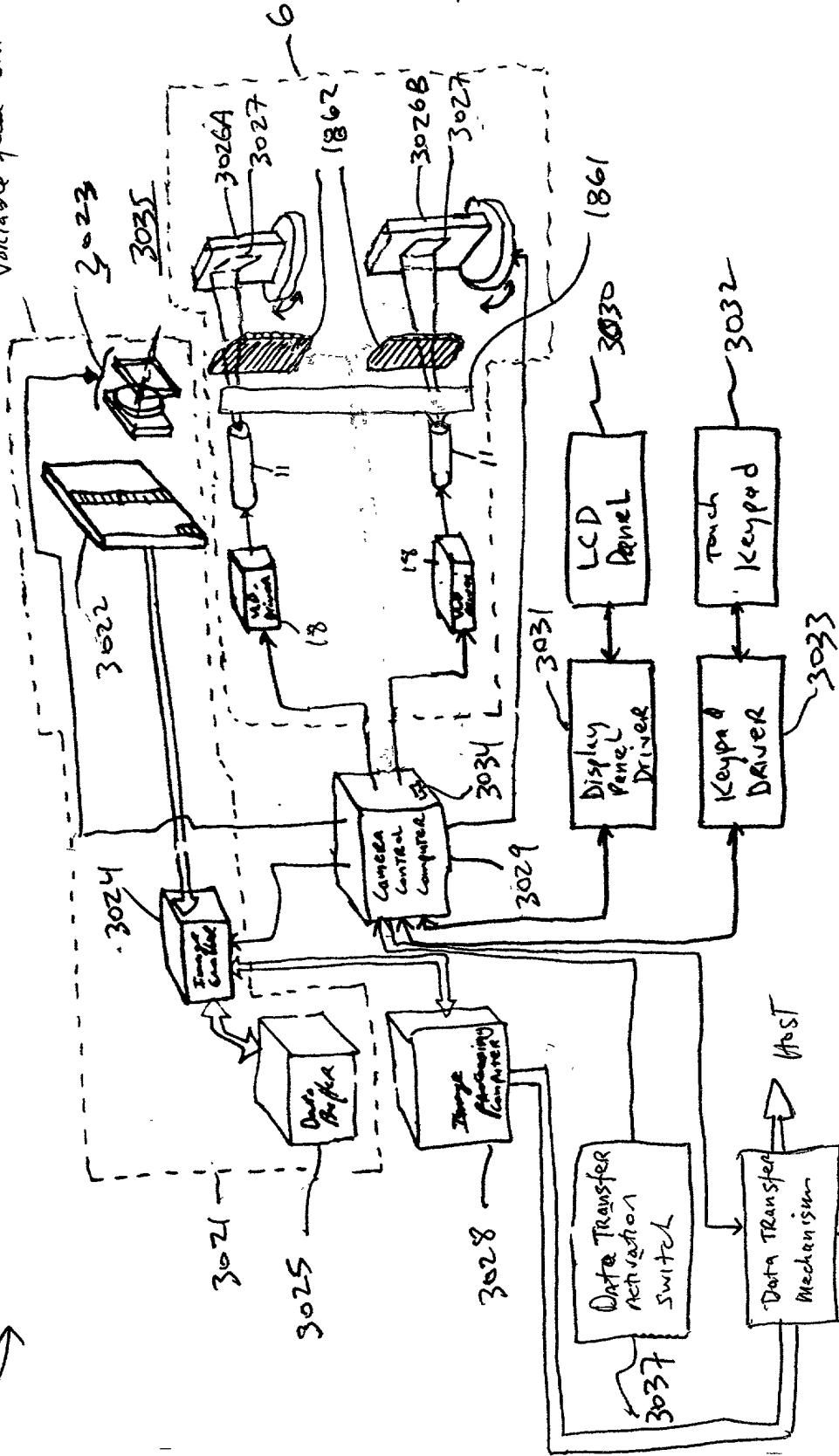
Auto/Manual Object Detection

FIG. 53B3

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fixed focal length/
variable focal distance

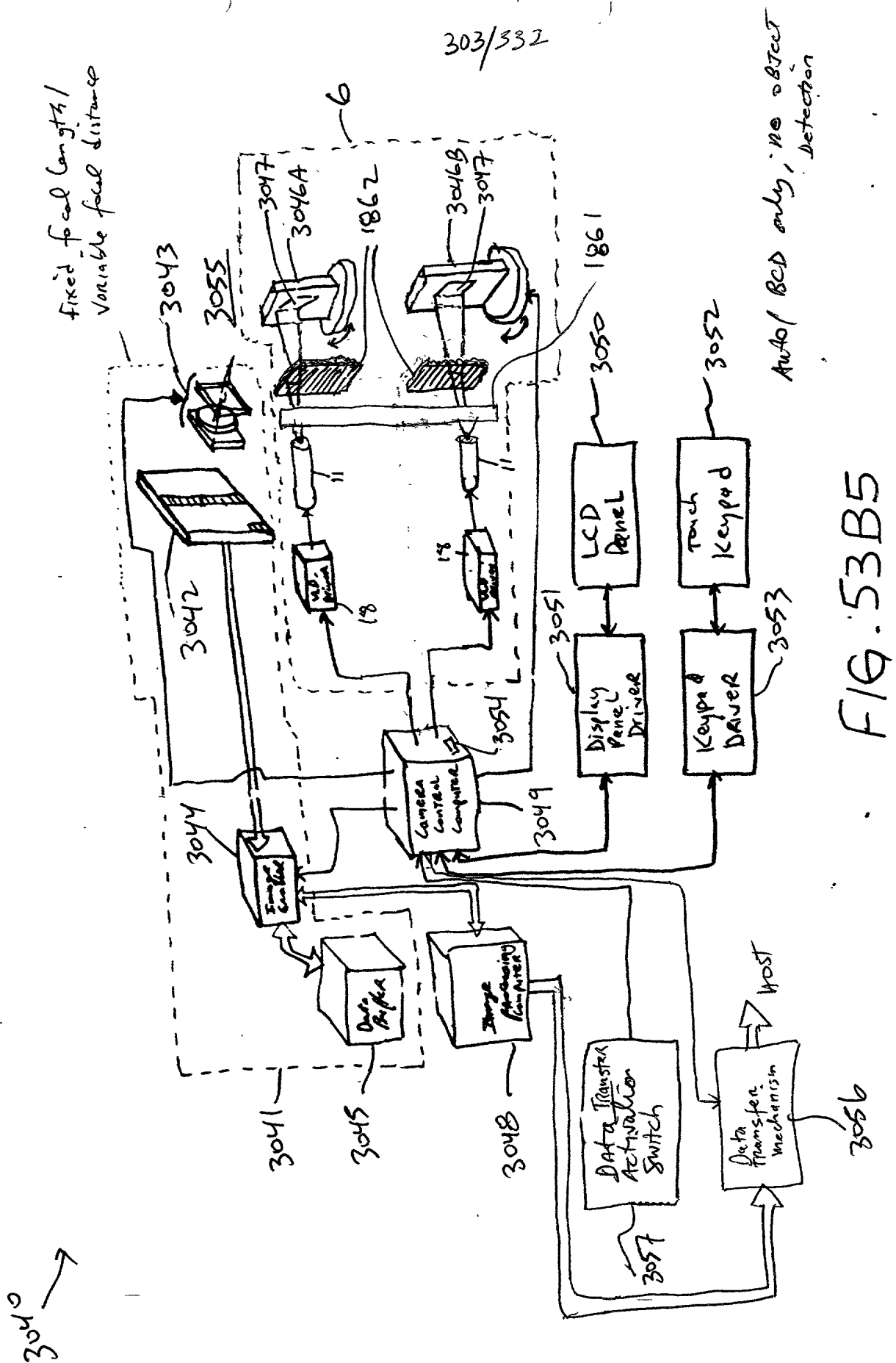
3020



Auto / Passive Object Detection
using CCD array

FIG. 53B4

3036



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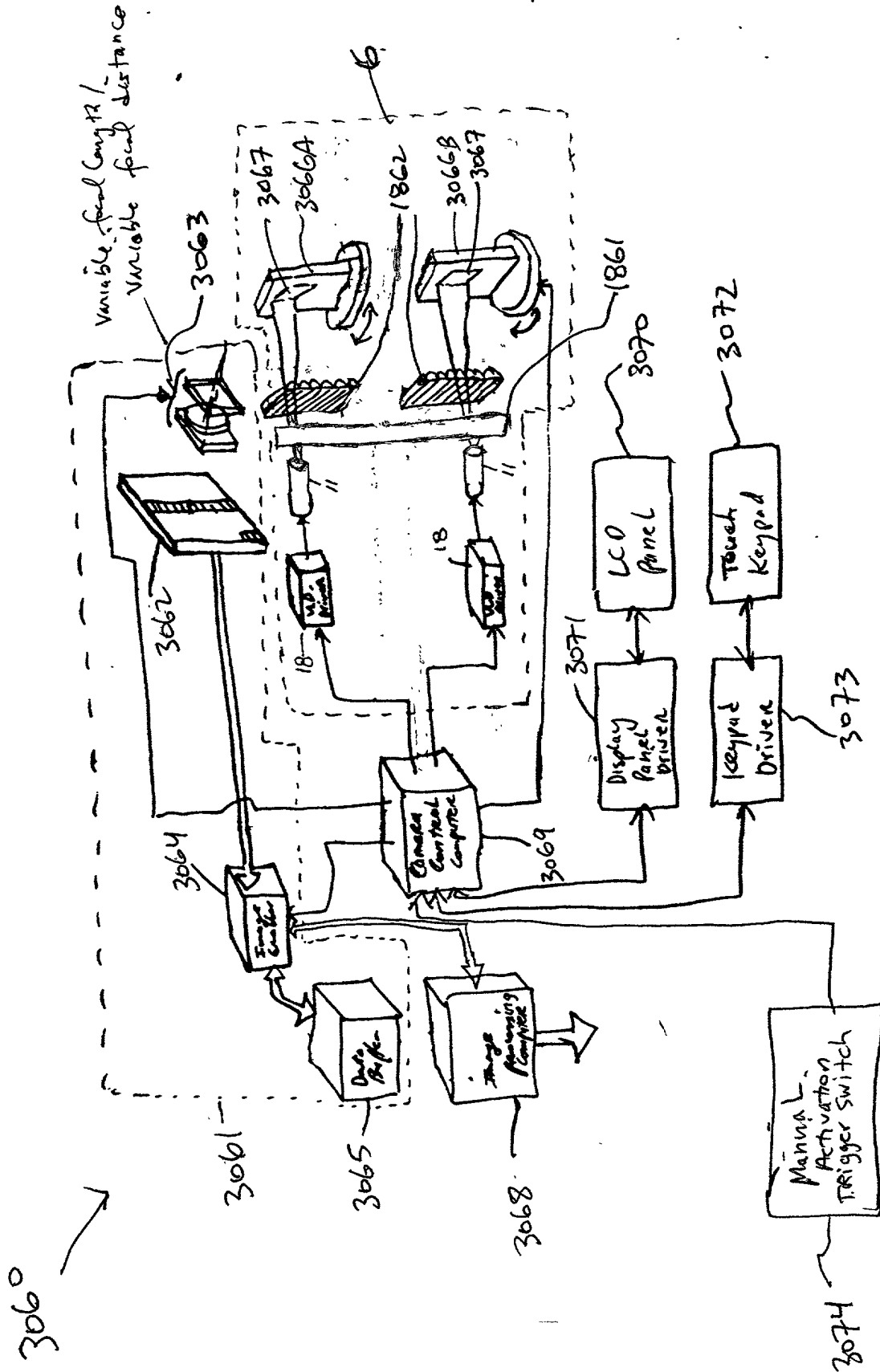
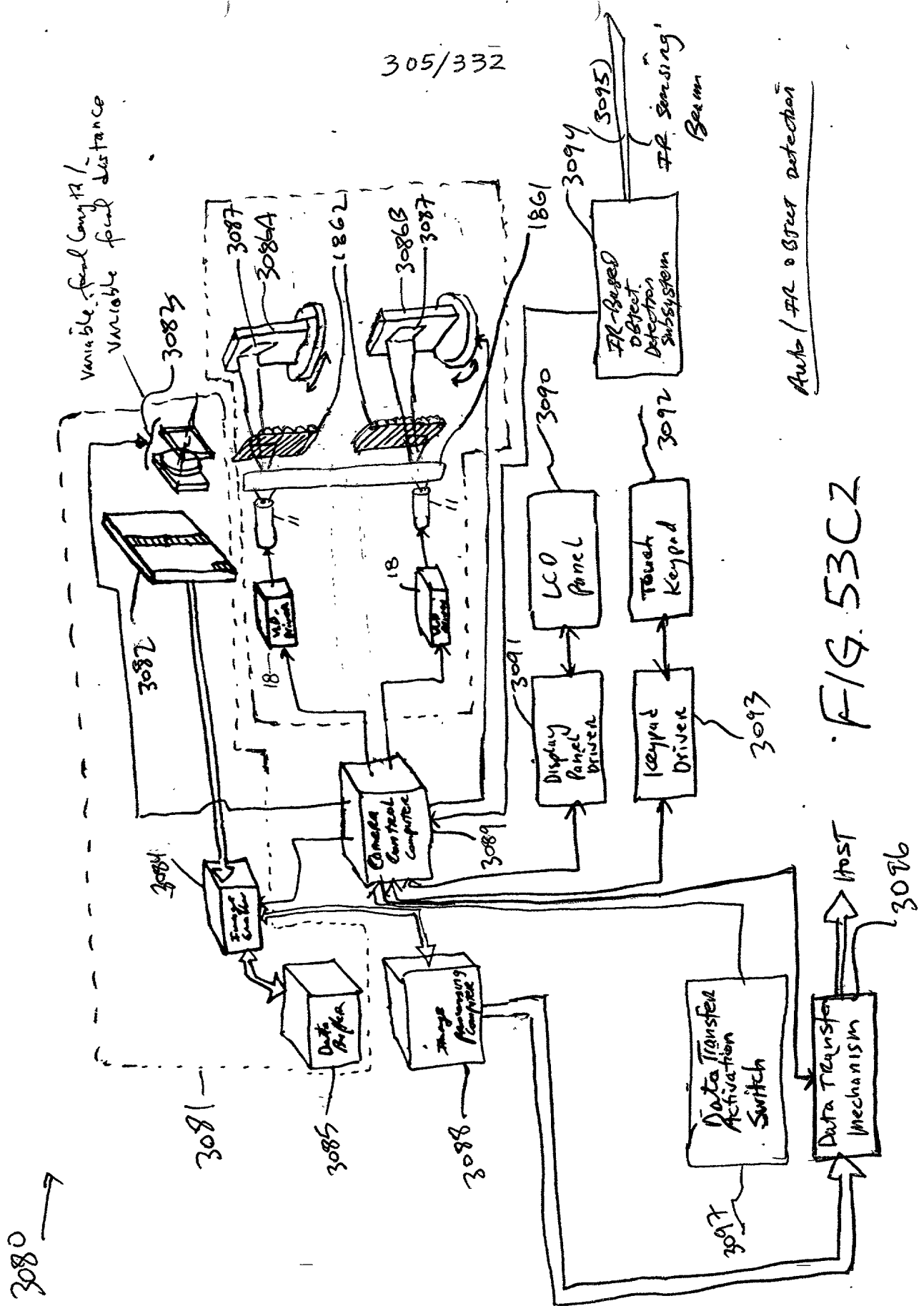
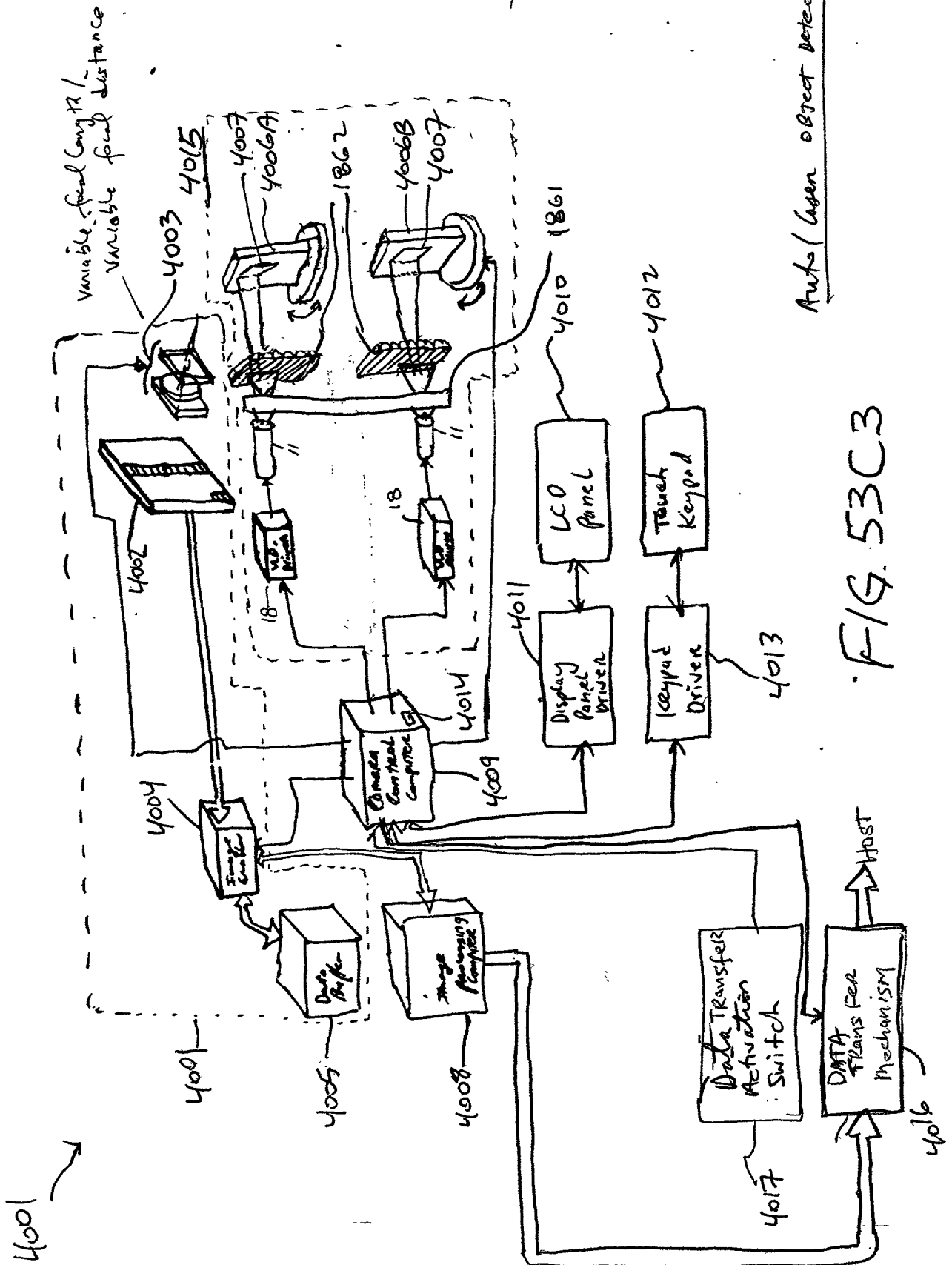
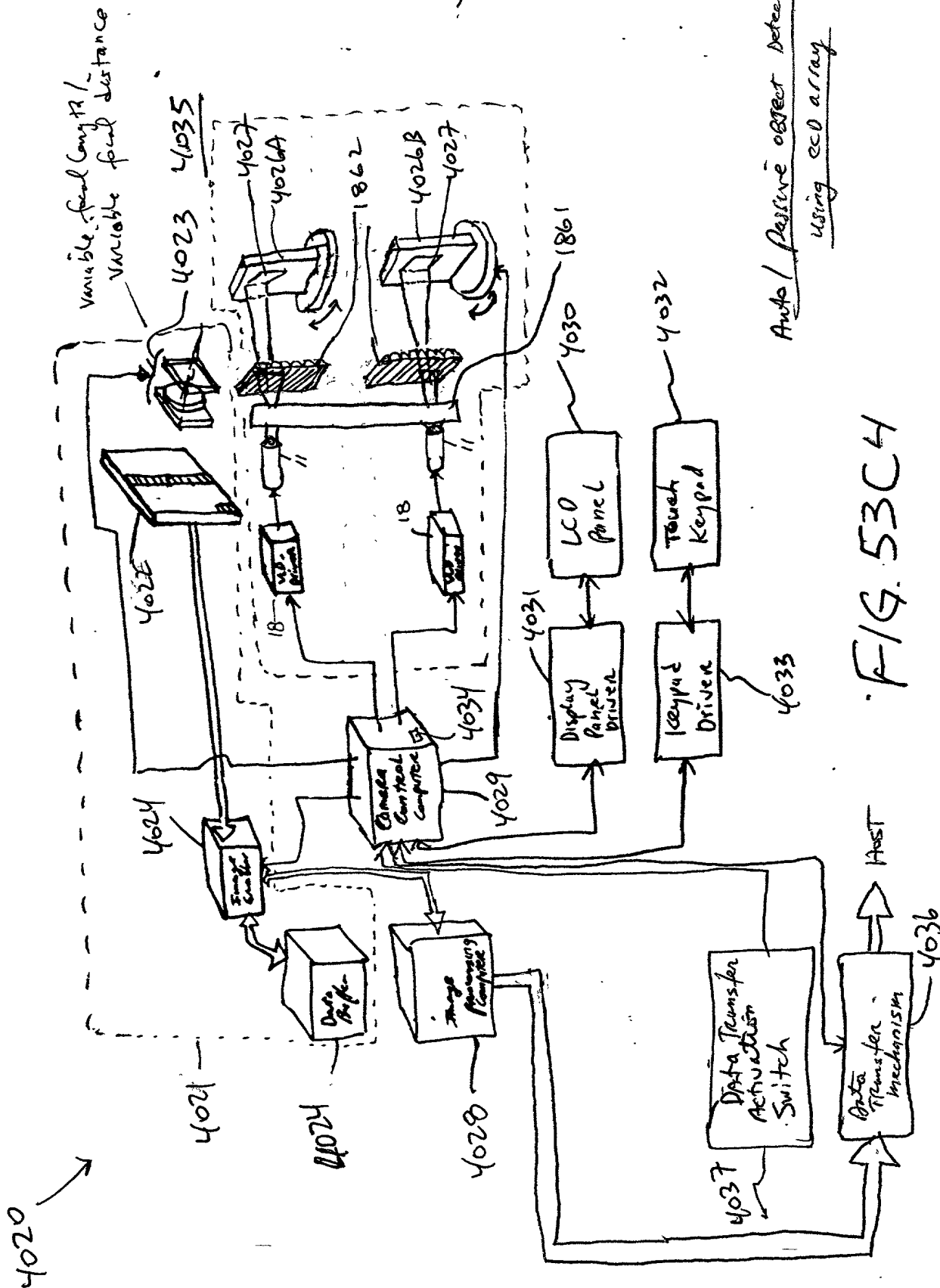


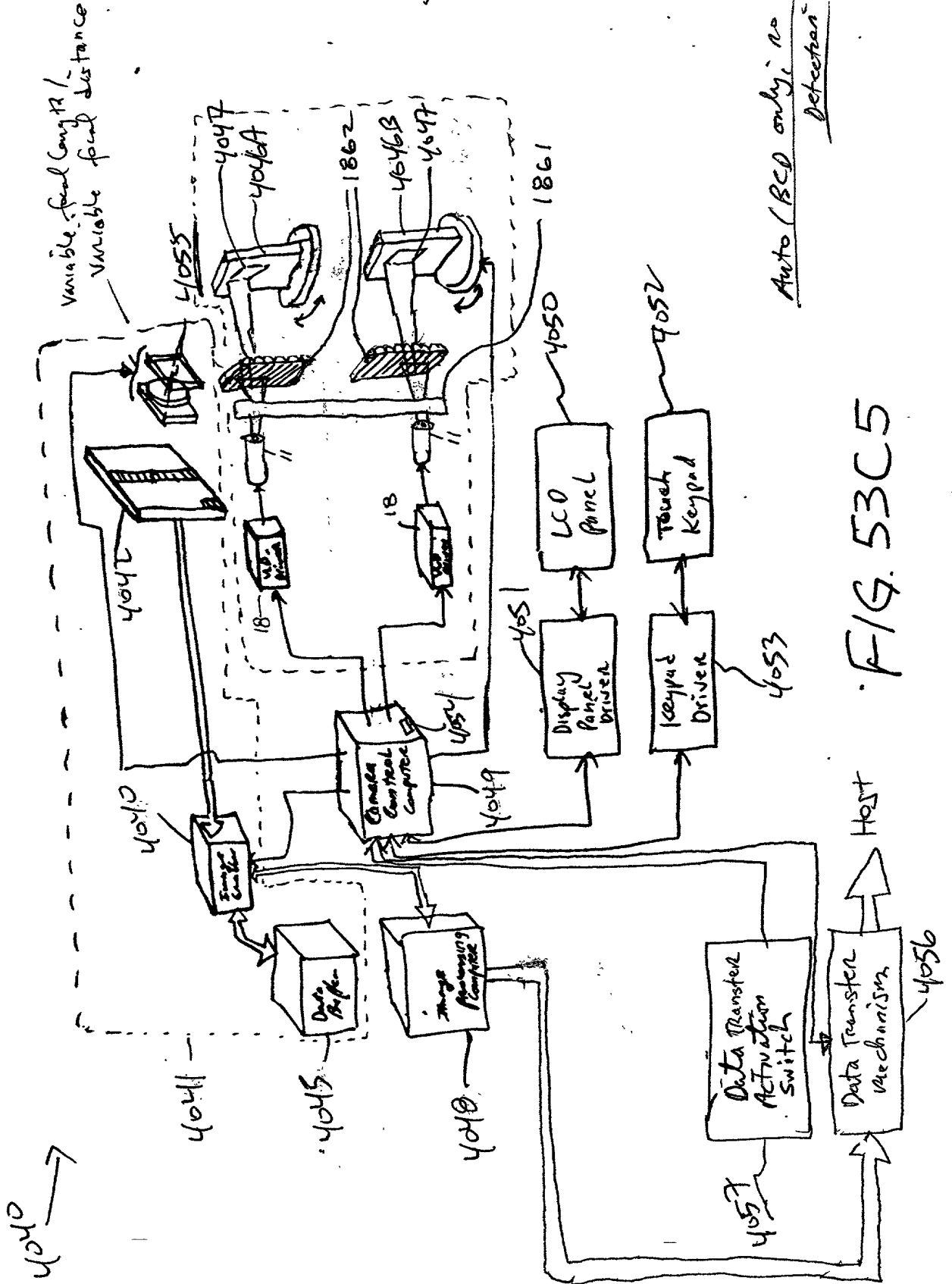
FIG. 53C1







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Auto (BCD only) no object detection

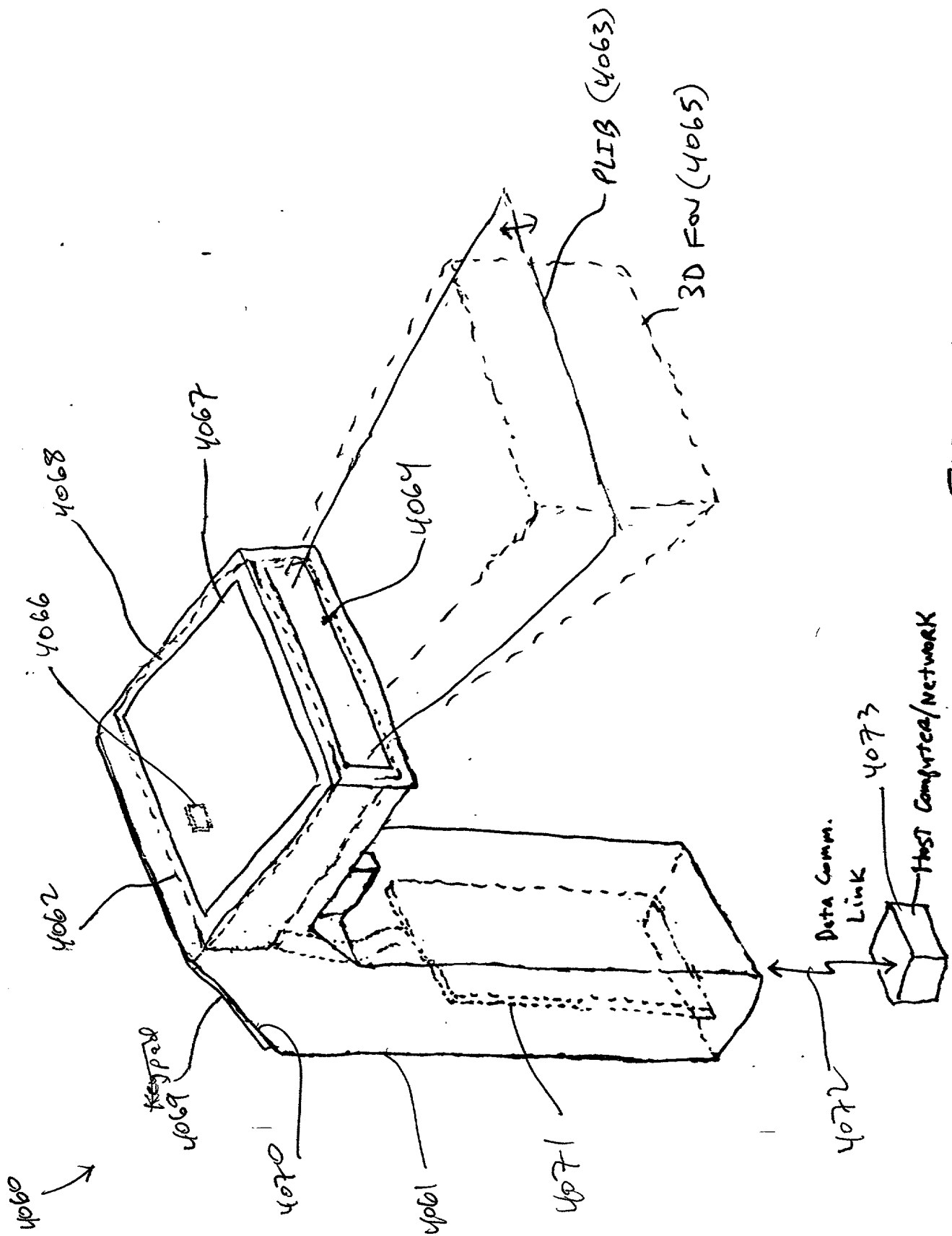


FIG. 54A

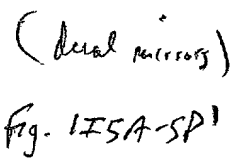
[illegible]

FIG. 54B

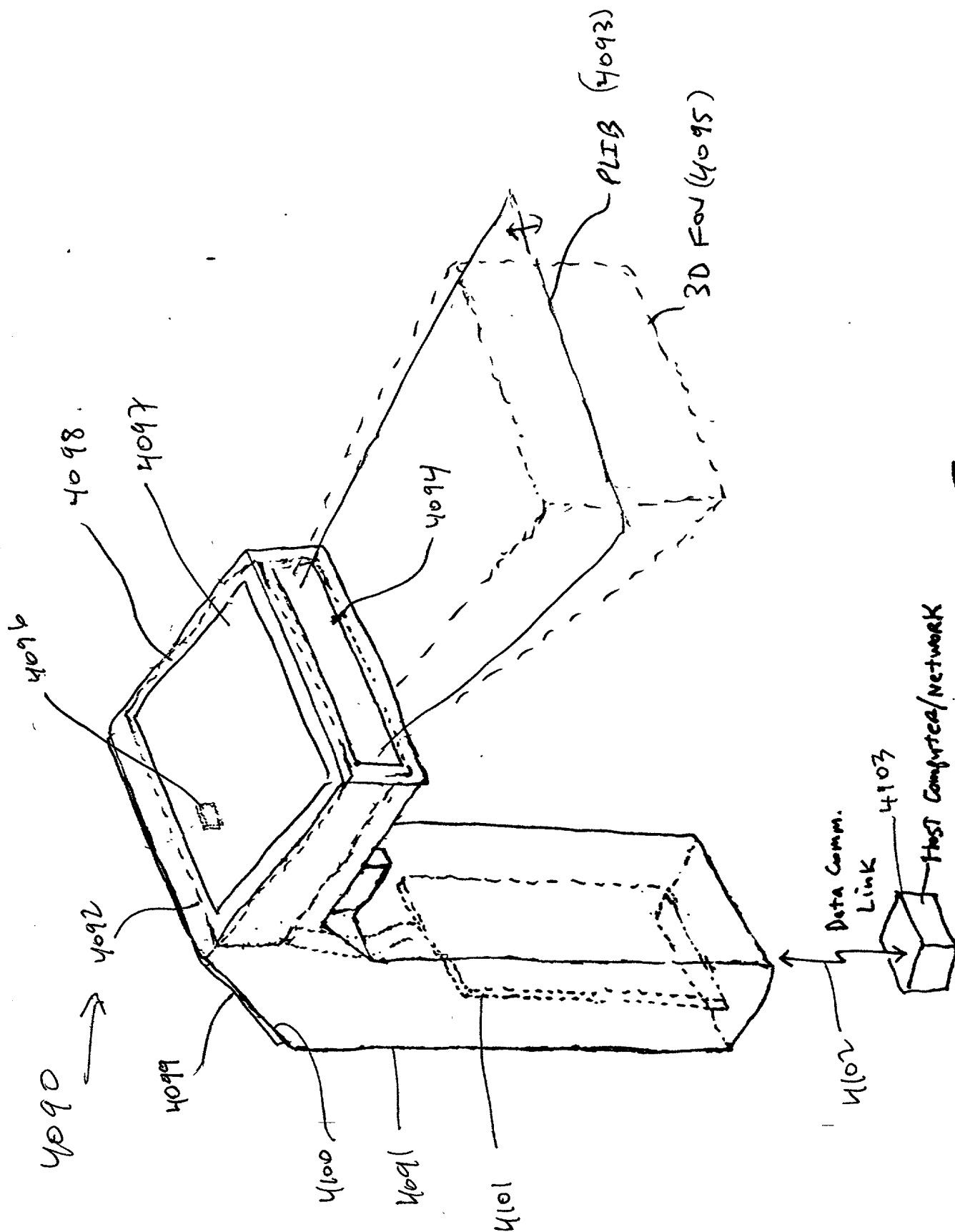


FIG. 55A

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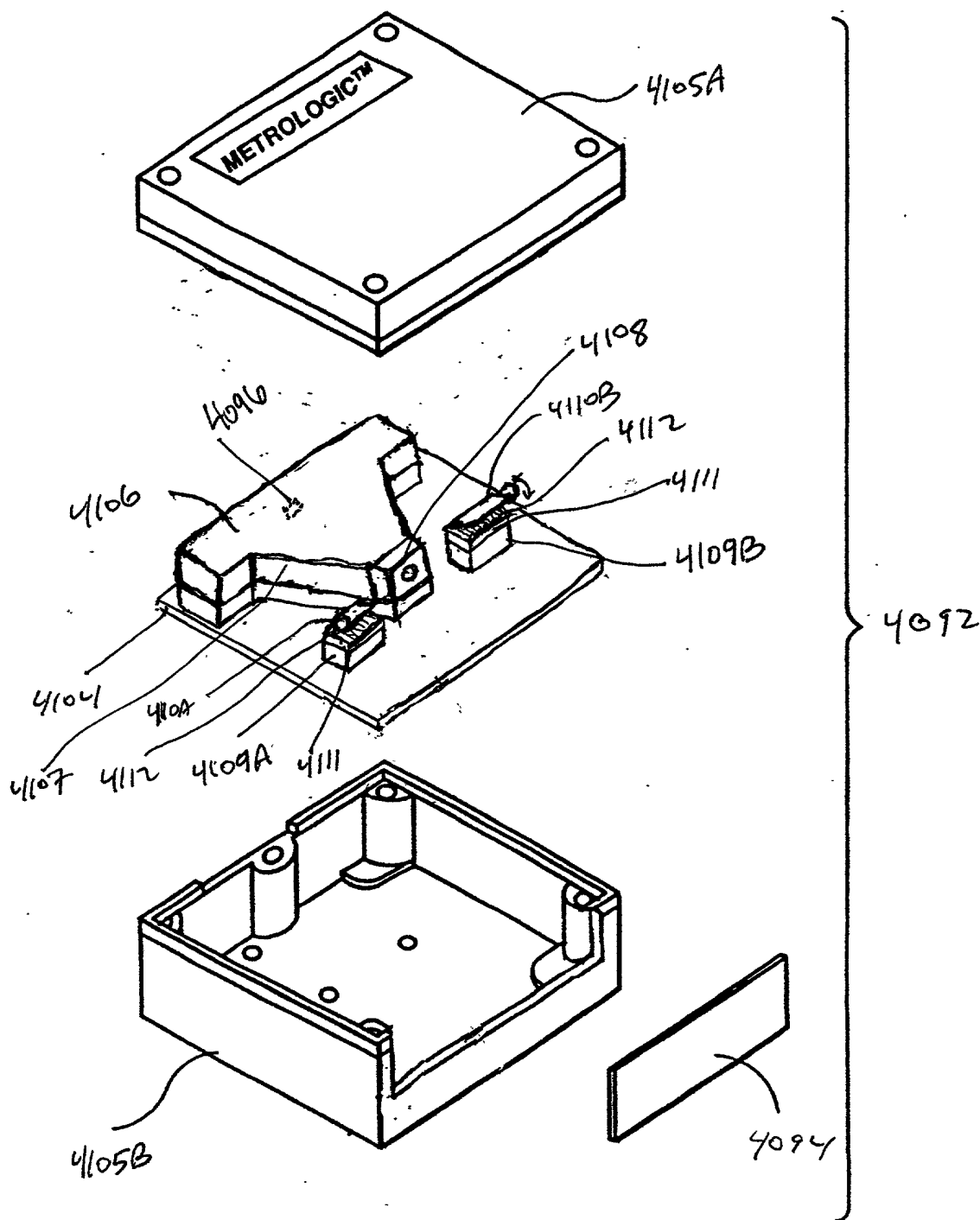


FIG. 55B

Brogg cell
Fig. 126A-6B

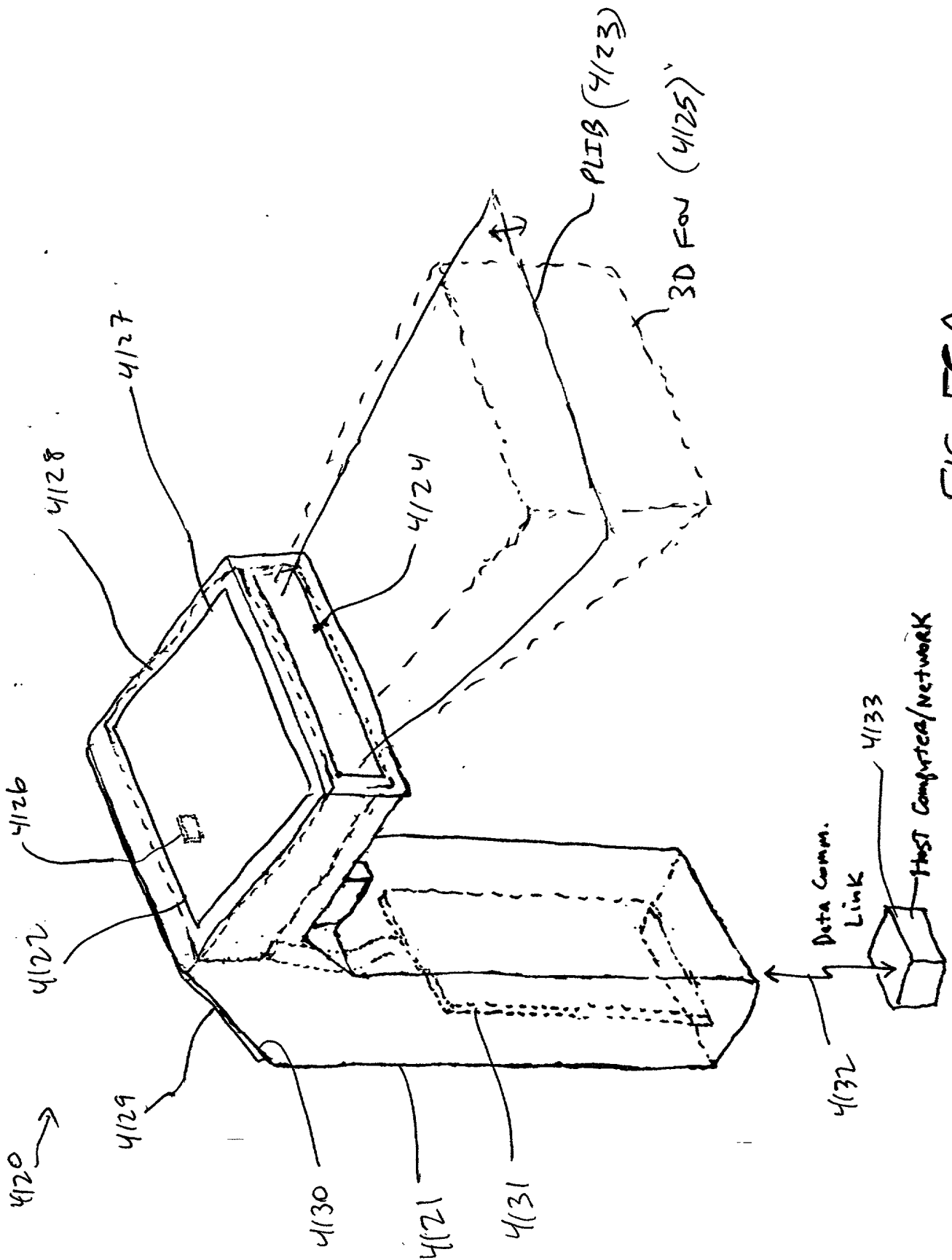


FIG. 56A

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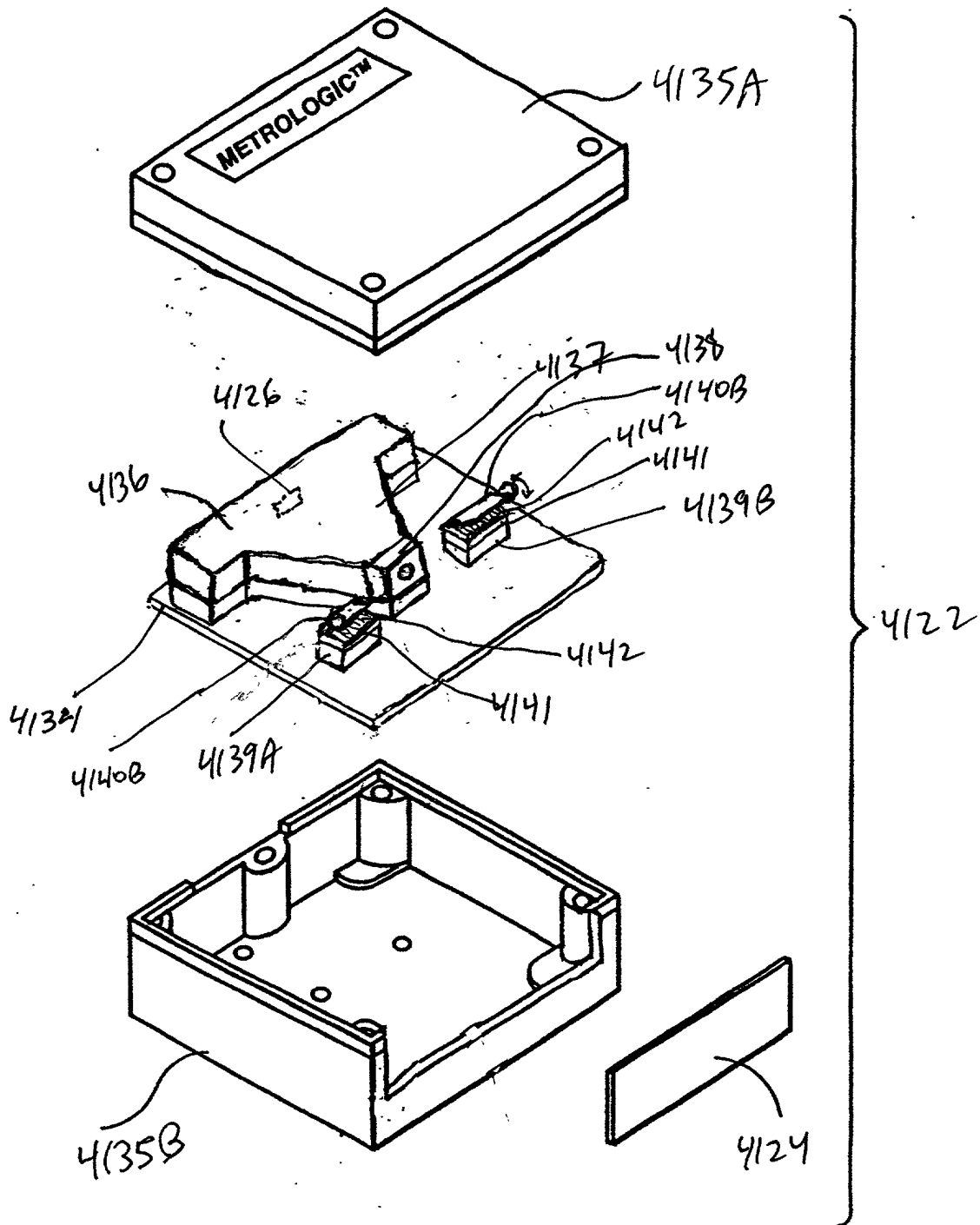


FIG. 56B

DM

Fig. 1F7A-7C

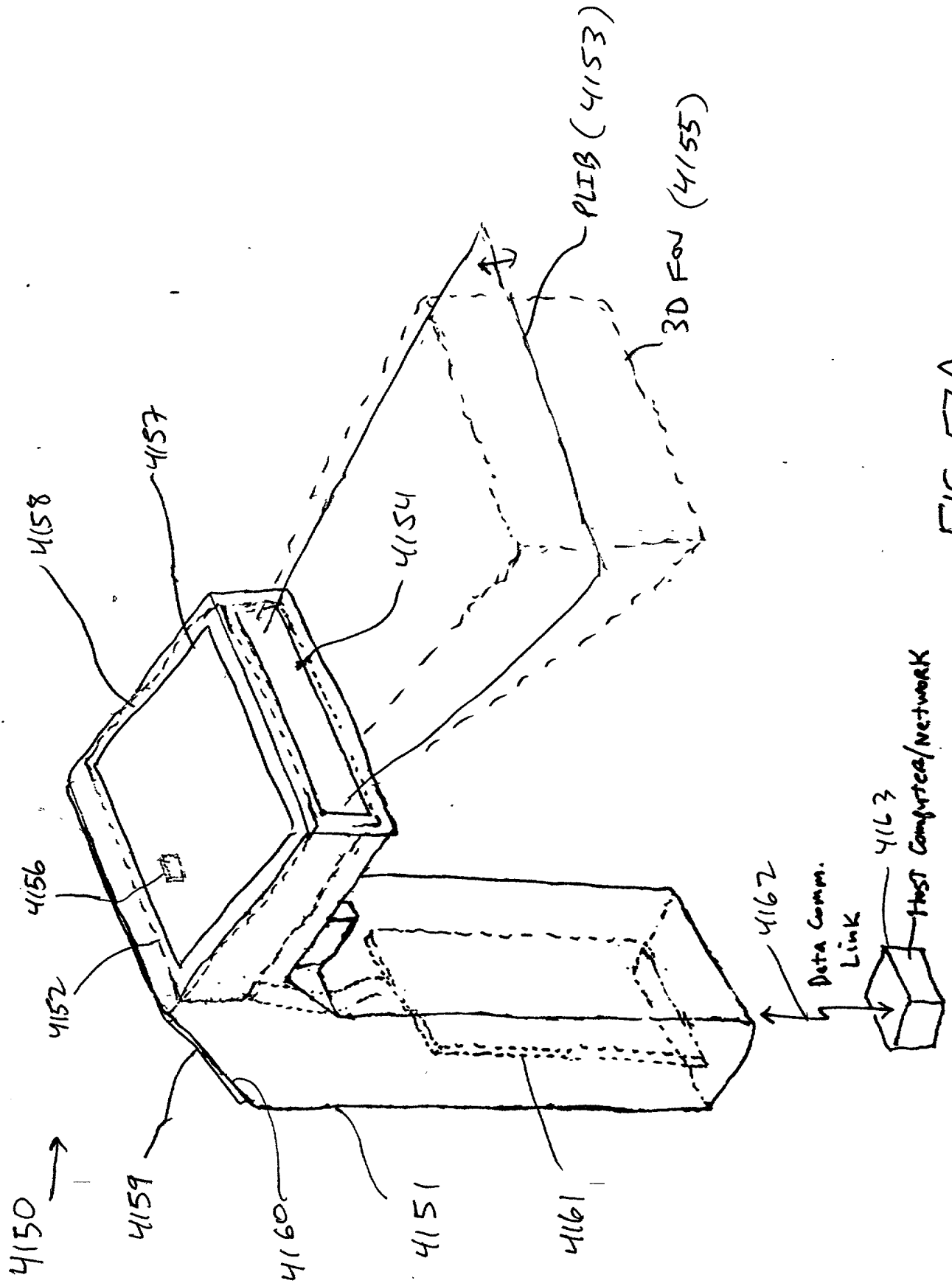


FIG. 57A

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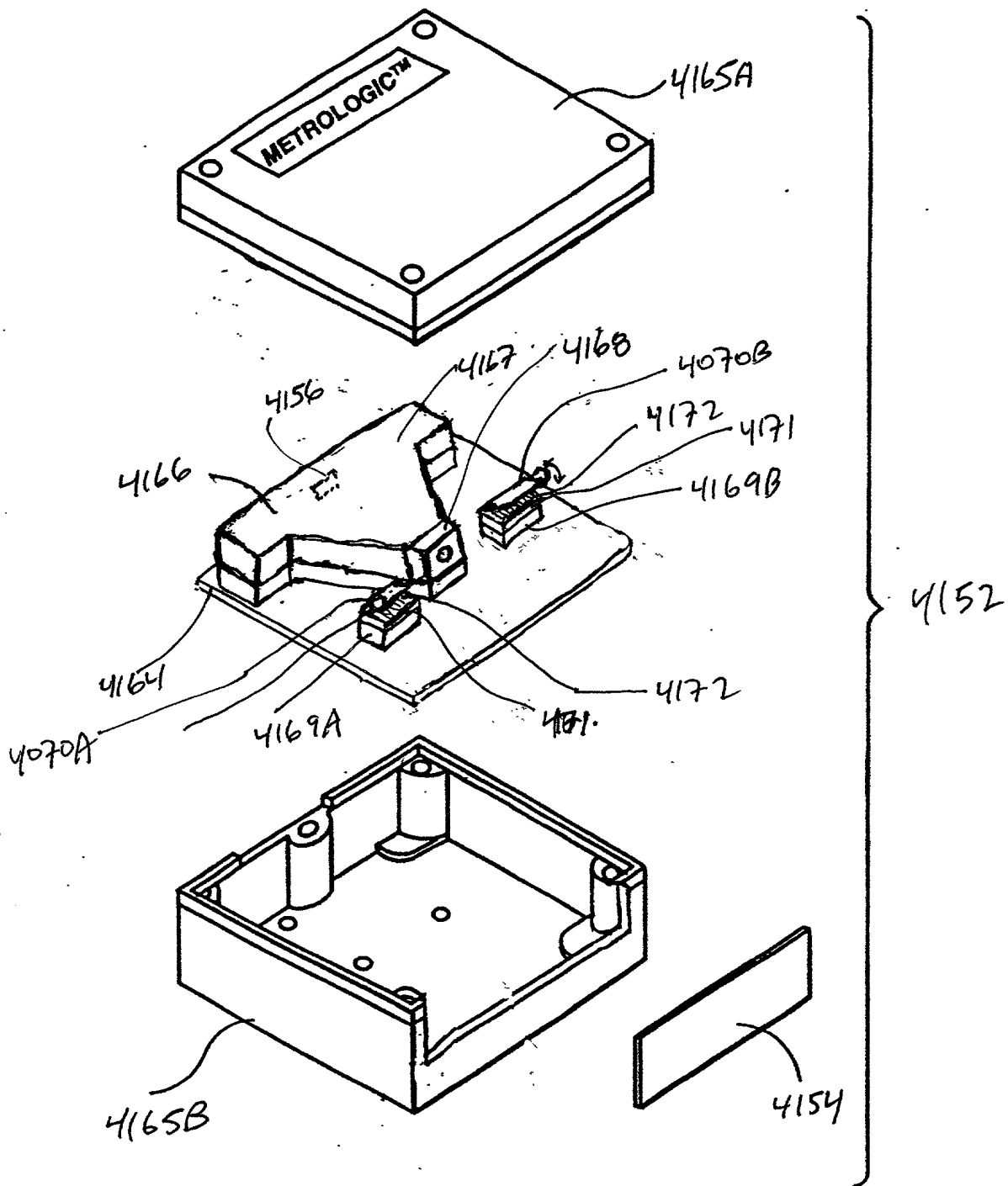


FIG. 57B

Phase only LCD
PM panel

Fys 1F8F-86

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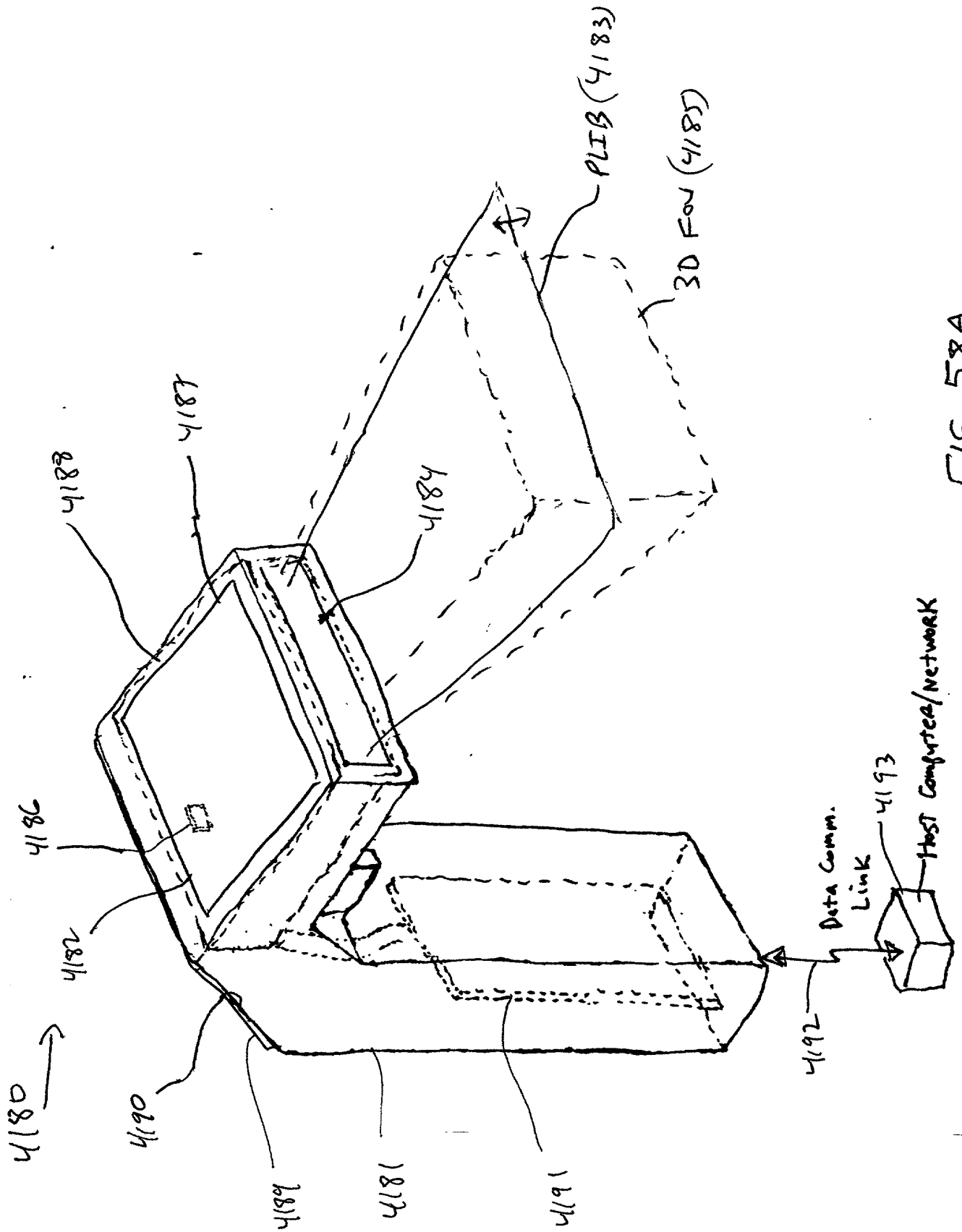


FIG. 58A

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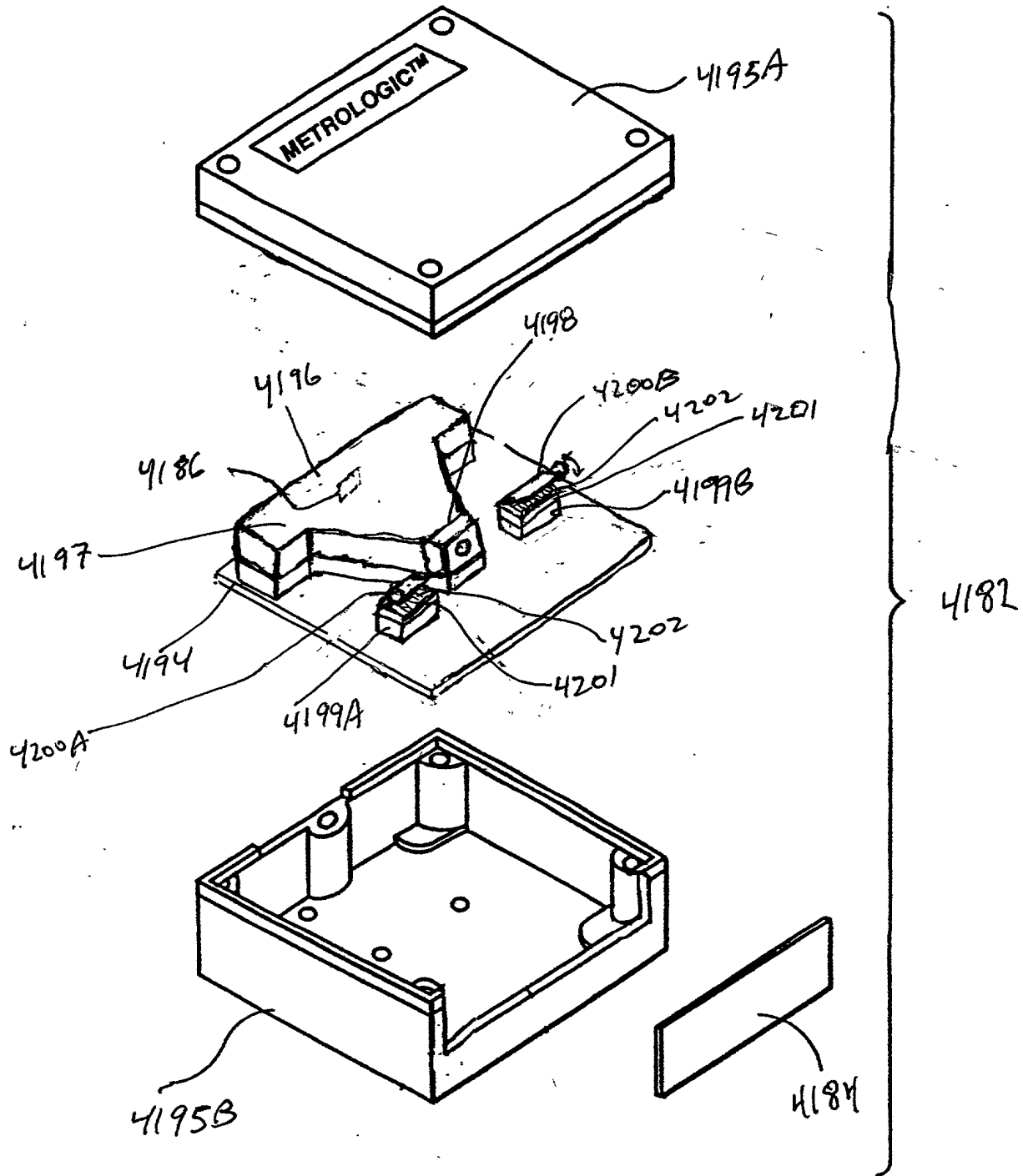


FIG. 58B

HS optical shutter

Fig. 1F 14A-14B -

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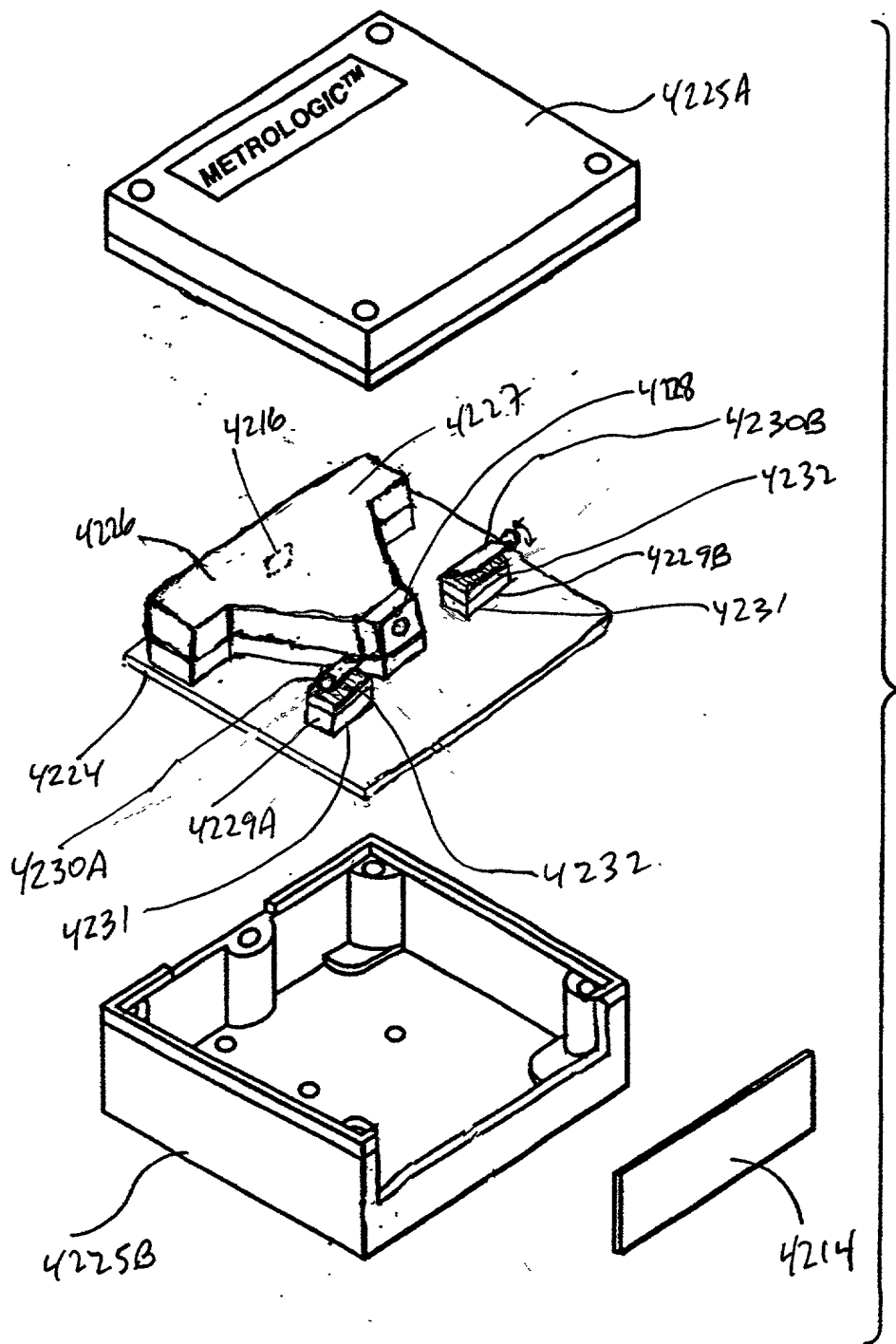


FIG. 59B

INCLD

Fig. 15A-15B

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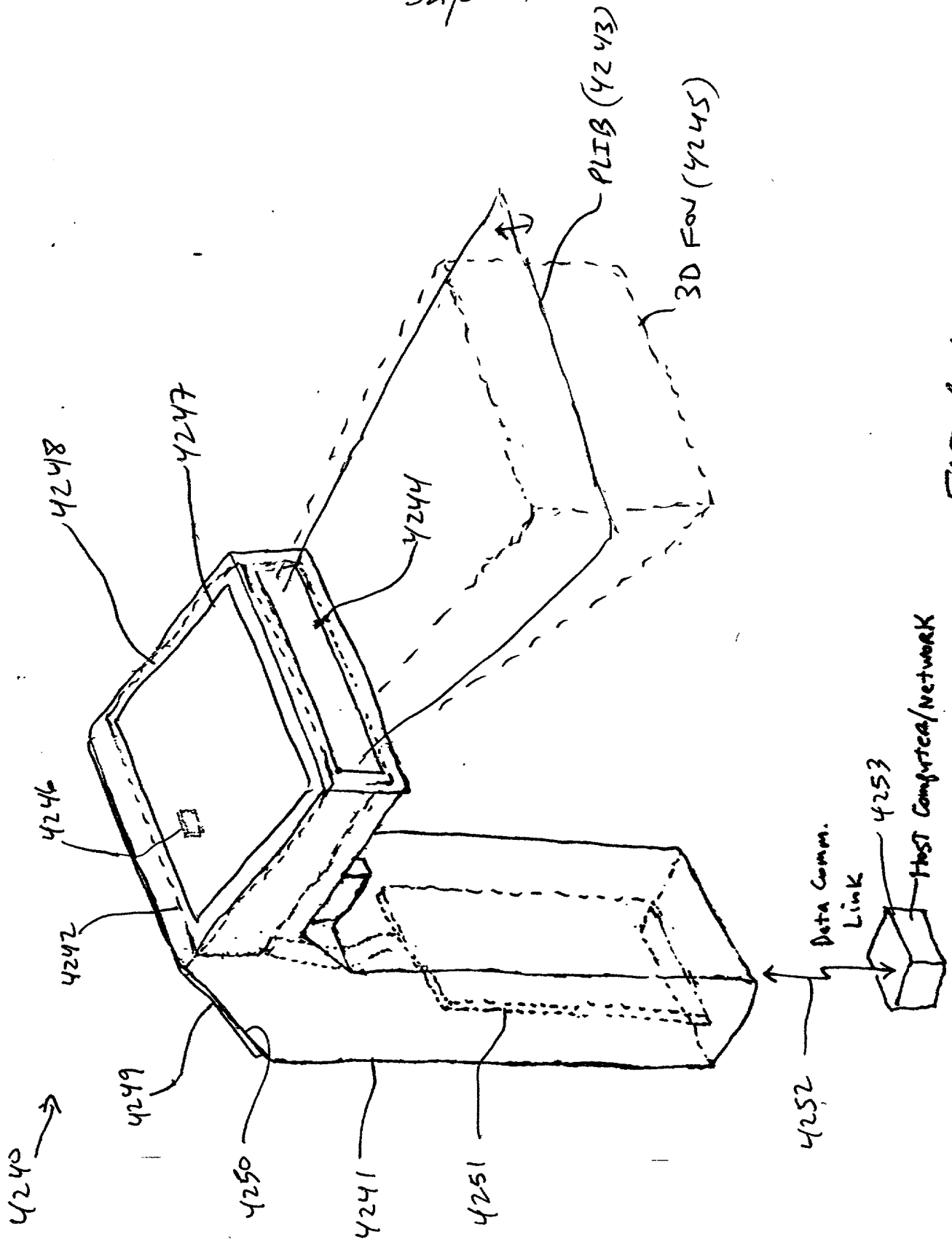


FIG. 60A

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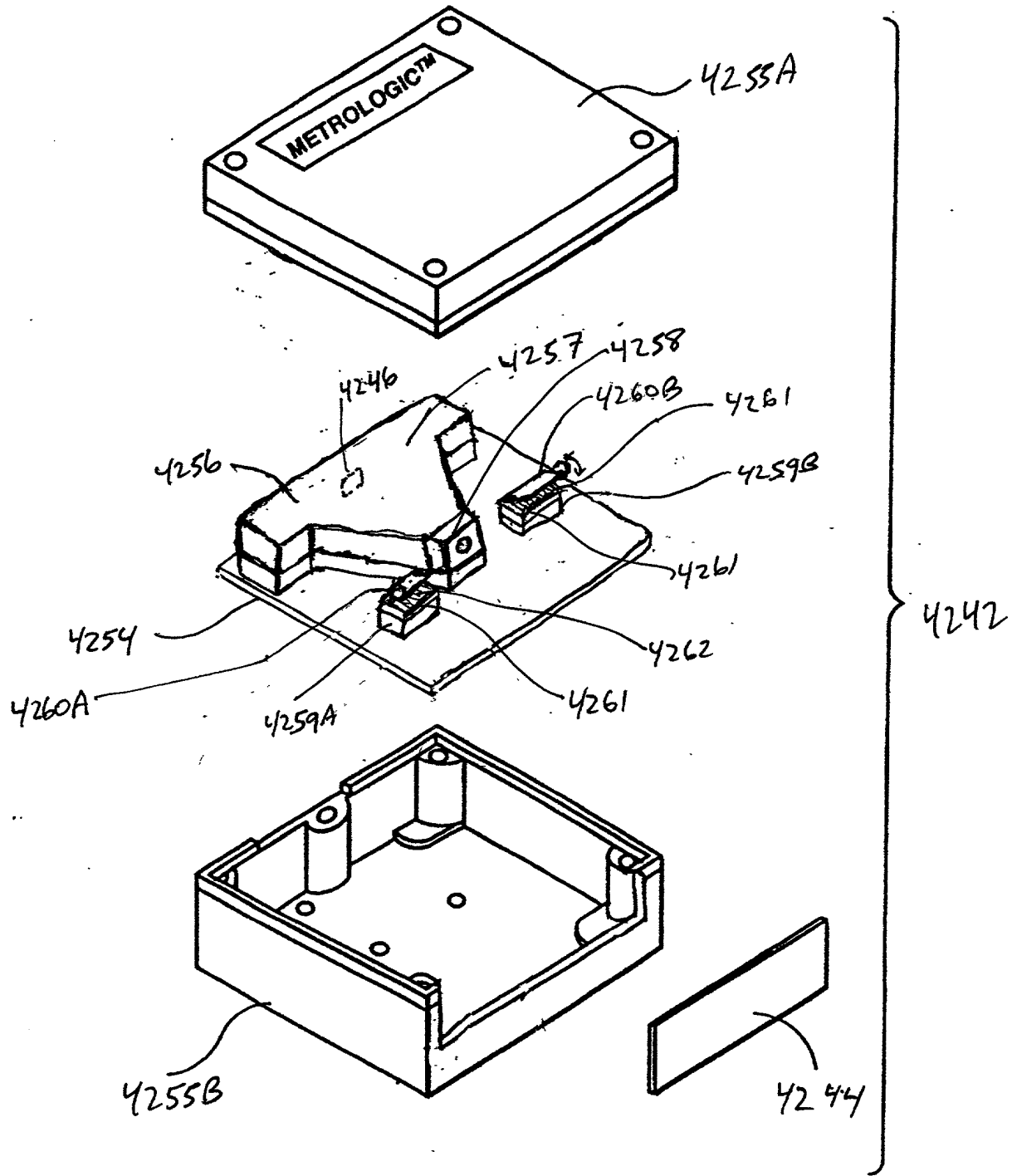


FIG. 60B

Bthalon (Tang. phase mod.)
Fig. 117A-17B

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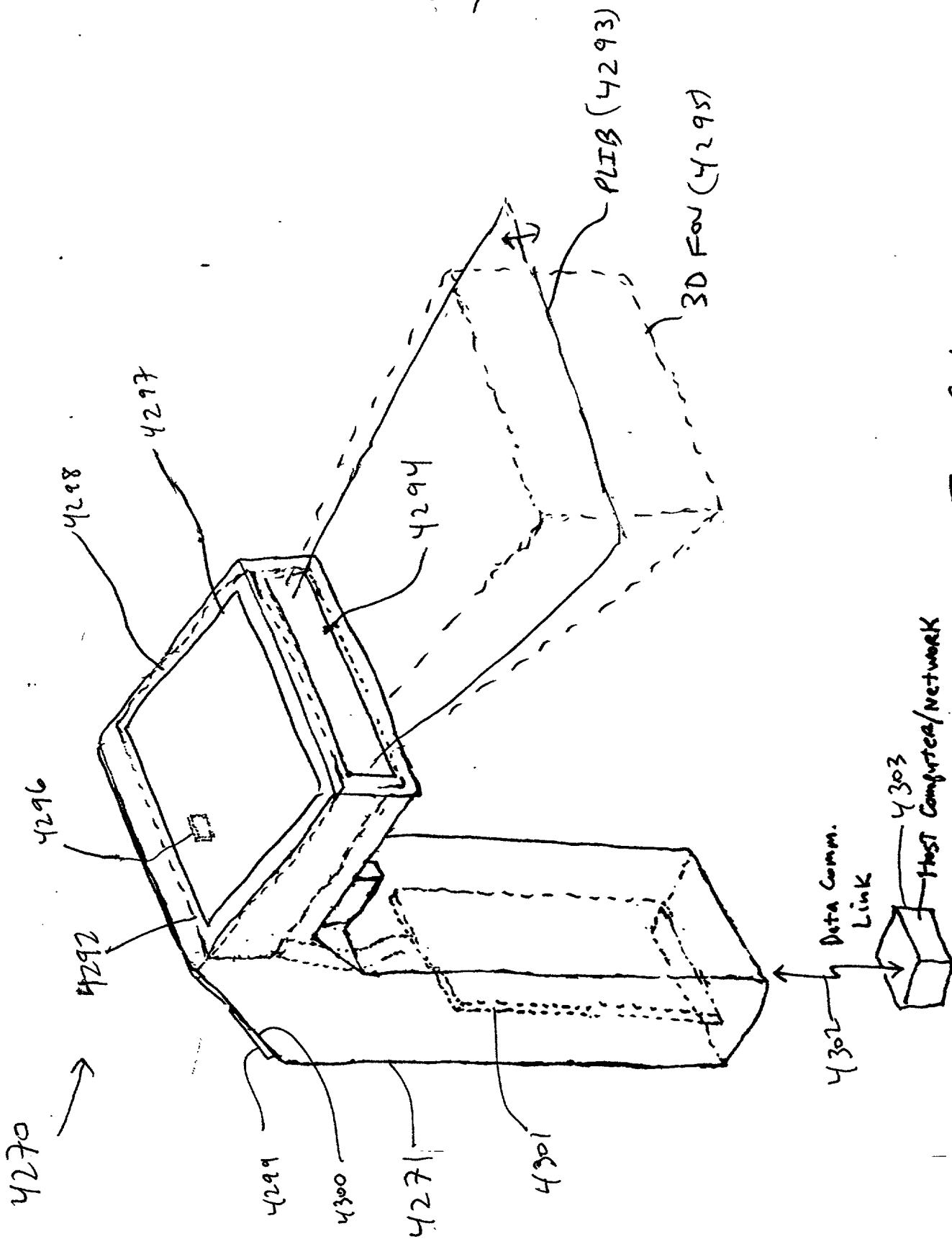


FIG. 61A

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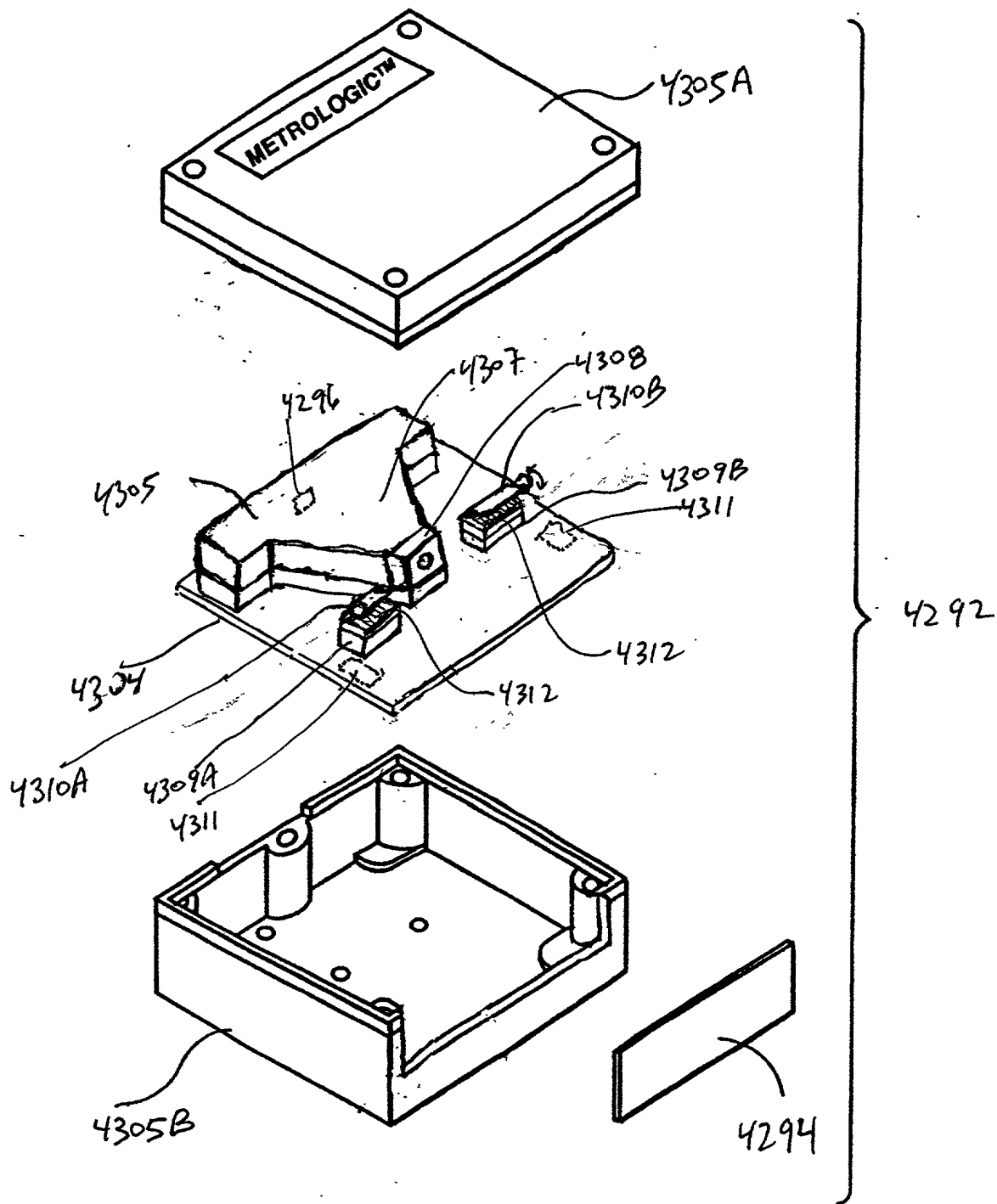


FIG. 61B

mod. hopping

Fig. 1A-19B

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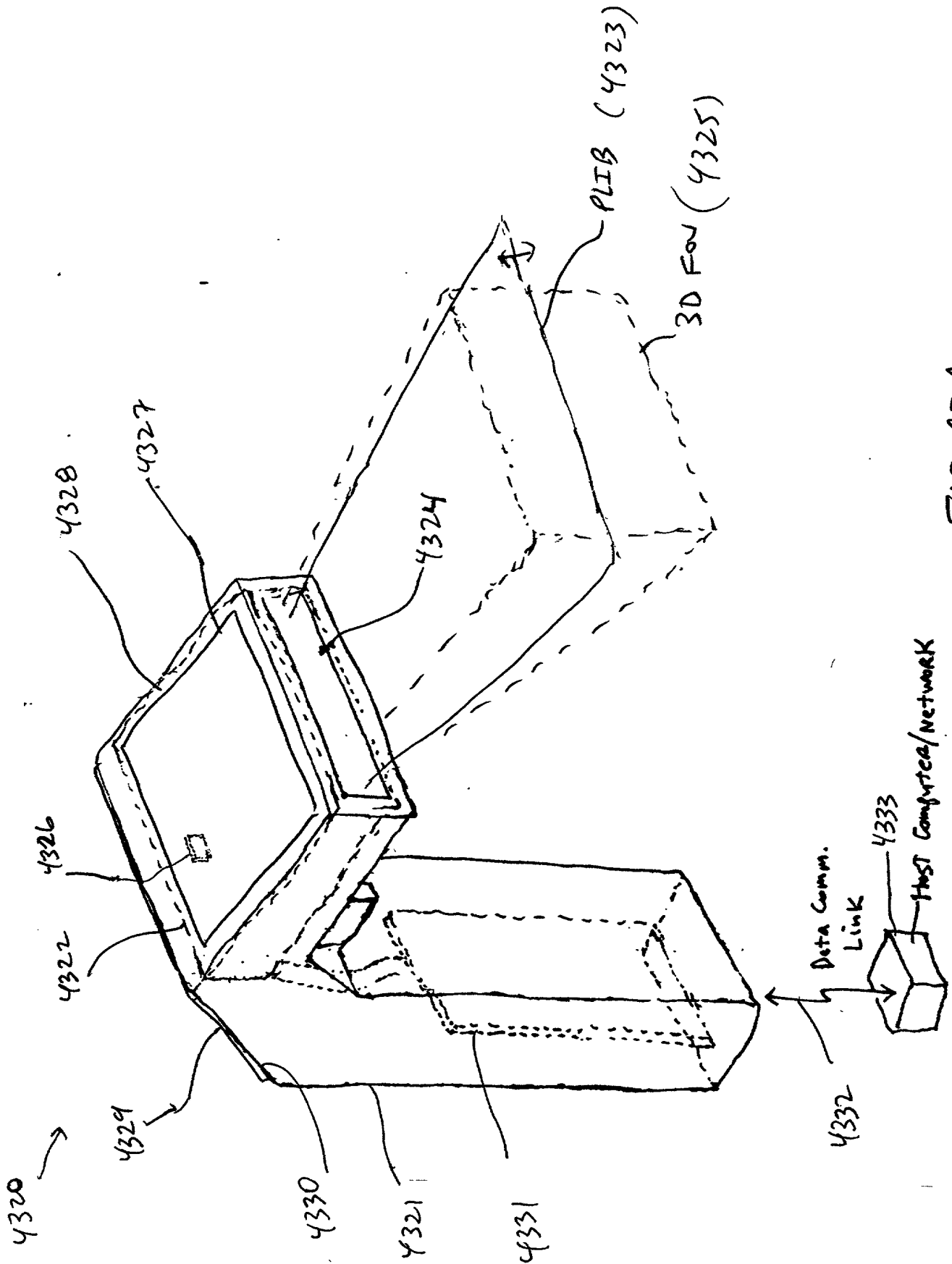


FIG. 62A

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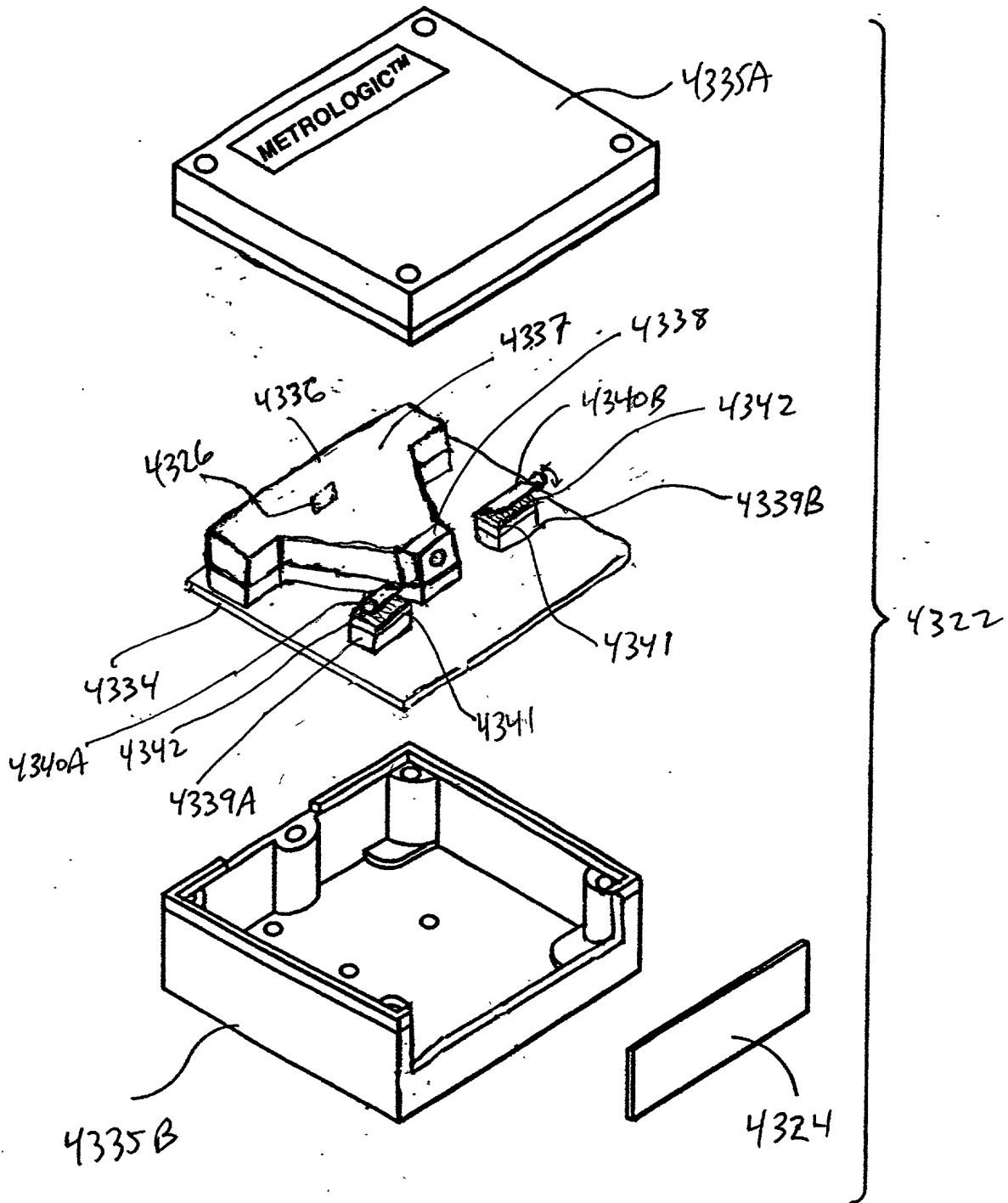


FIG. 62B

measuring
spot intensity
mod. panel

Fig. 1F21A-21D



FIG. 63A

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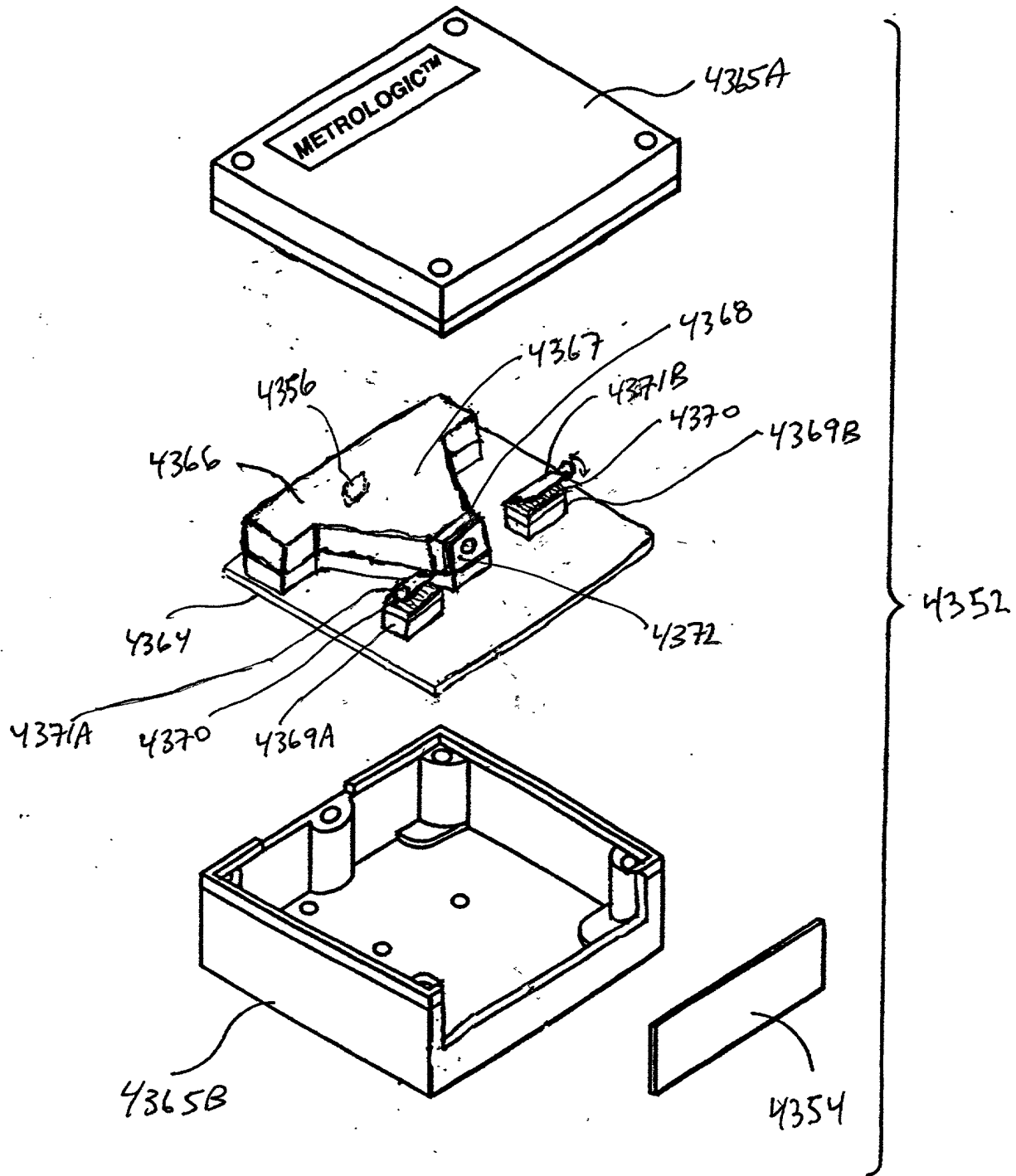
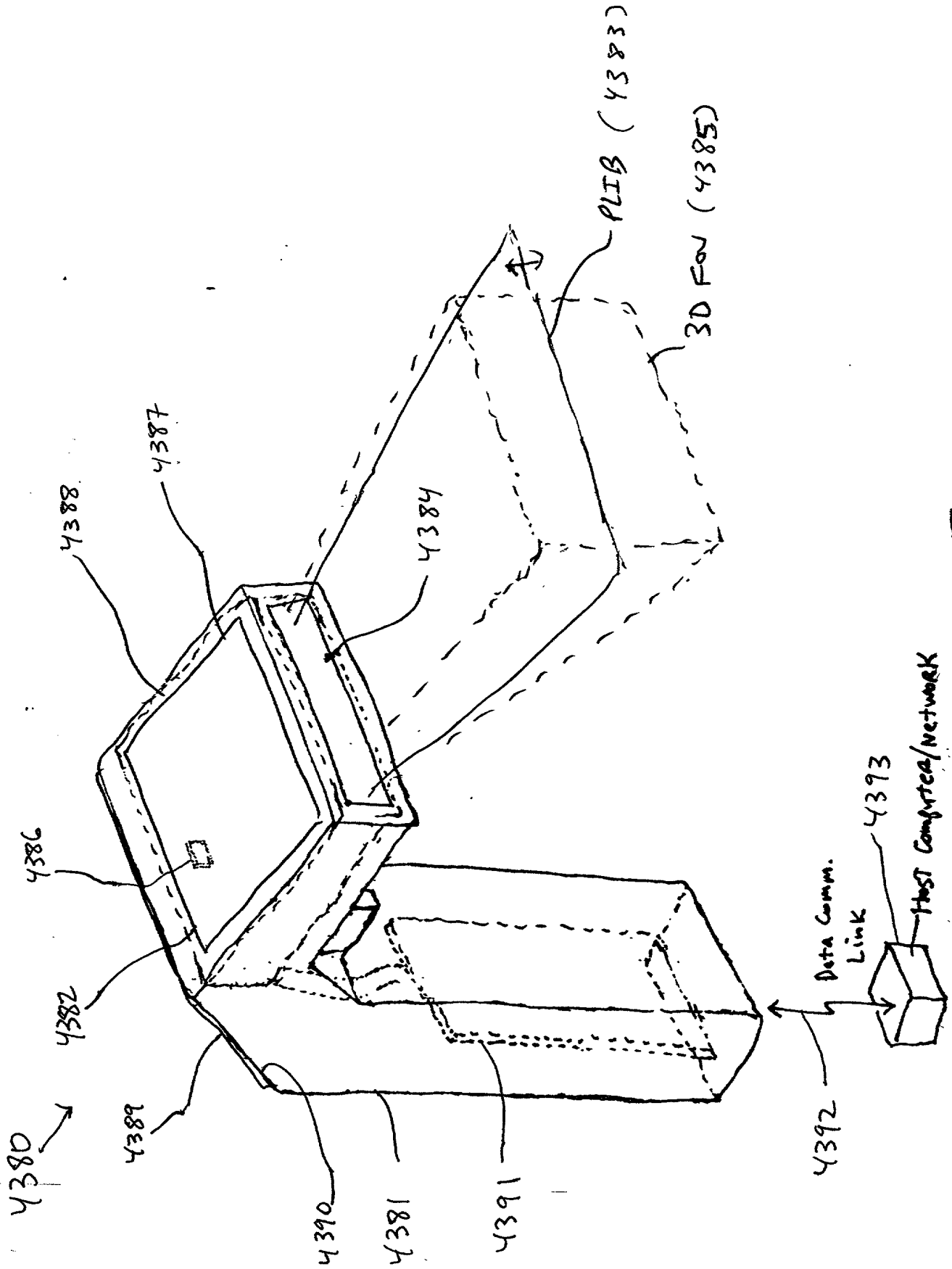


FIG. 63B

ED of
mechanical rotating IPIS

Fig 1F
23A-23B

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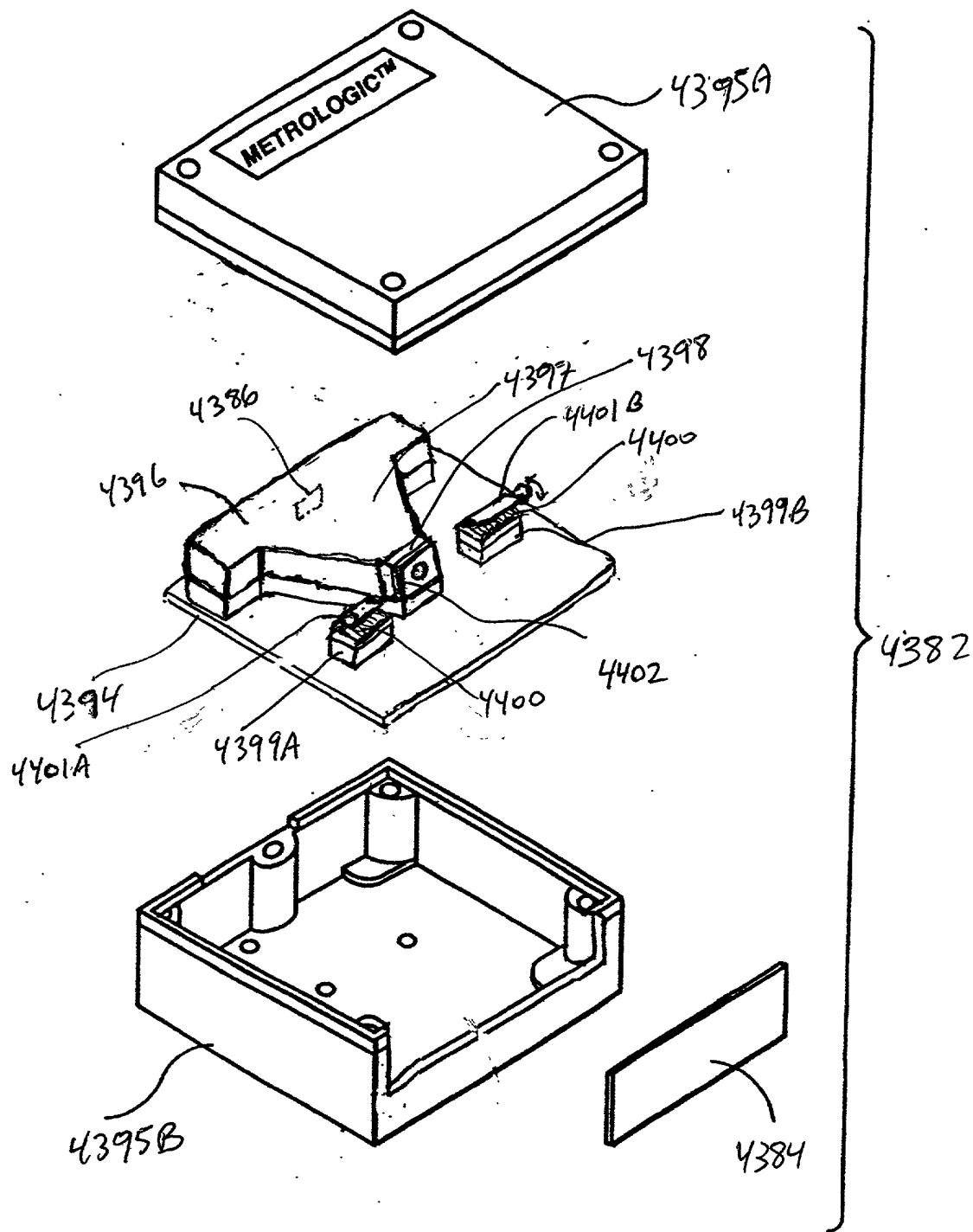


FIG. 64B

* E-optical
Shutter Before
FP lens
Fig. 1E24A

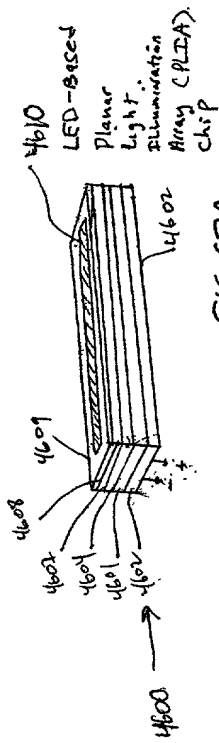


FIG. 67A

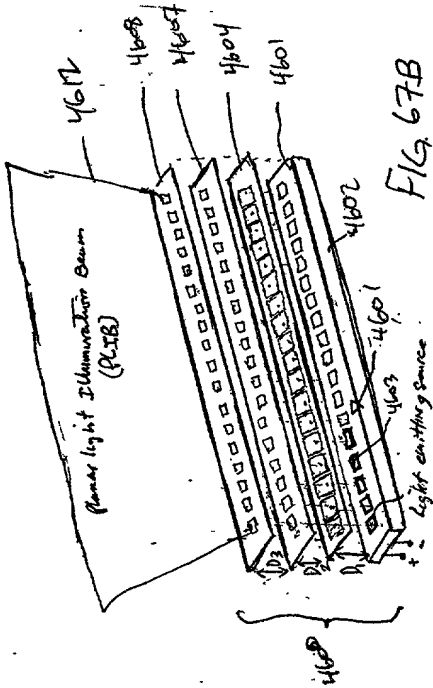


FIG. 67B

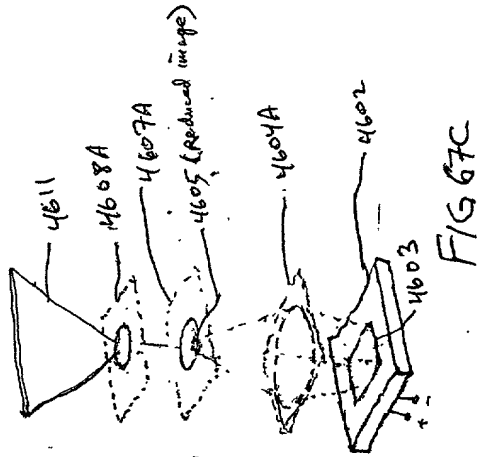


FIG. 67C

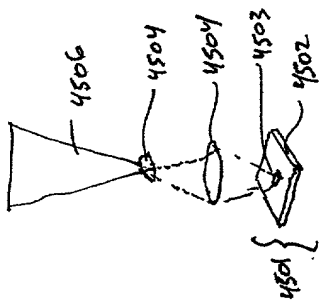


FIG. 65B

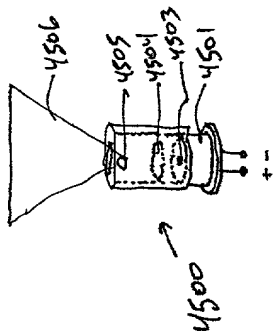


FIG. 65A

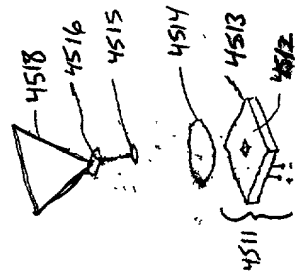


FIG. 66B

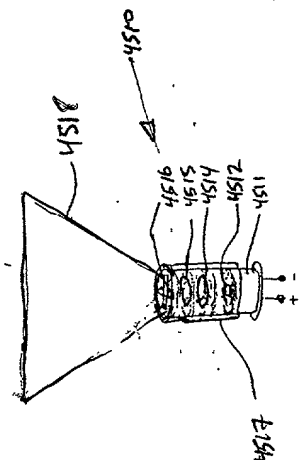


FIG. 66A

Baggage check-in Station #1

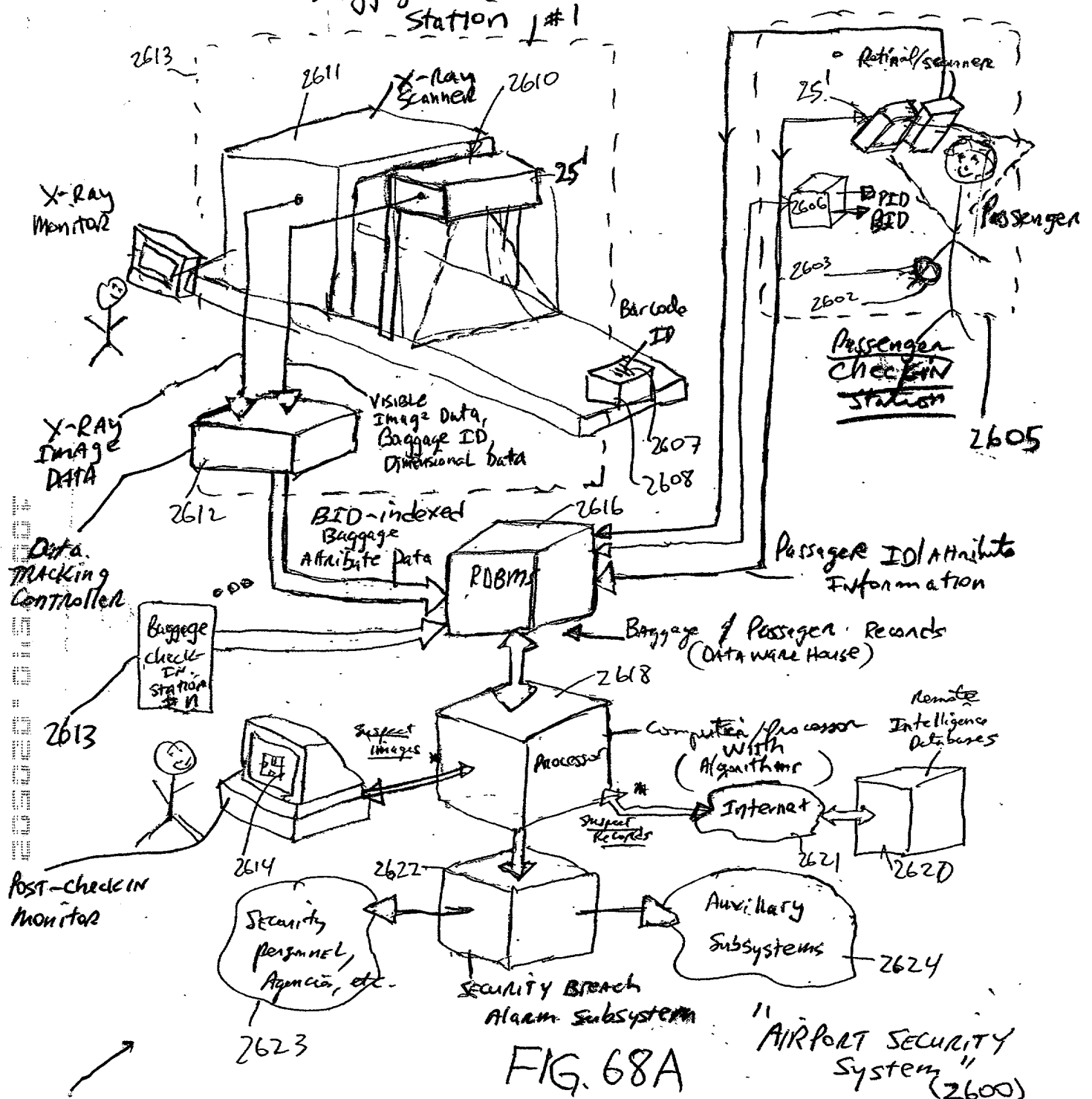


FIG. 68A

RDBMS Record X

Attribute data	2621
Passenger ID #	2620
Baggage ID #	2622
Baggage ID #	2622

FIG. 68B